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VOL. CLIV., No. 3026.] WEDNESDAY, MAY 11, 1921. [73RD YEAR.

INSTITUTION MEETING POSTPONED.

THE members of the Institution of Gas Engineers will not be surprised at the announcement we have to make to-day. At a meeting of the Emergency Committee of the Council yesterday, it was resolved—having regard to the coal dispute, and the prevailing conditions of industrial unrest—to postpone *sine die* the annual meeting of the Institution. This course, we are confident, will, in the circumstances of the times, fully commend itself to the members generally. The coal strike has already extended over forty days, or thirty-four working days; and there is no likelihood of it being settled immediately—in fact, up to the time of going to press, no meeting of the Executive of the Miners' Federation has been called for this week. Therefore, there is no probability of a prompt resumption of work at the pits; and, if this were the good fortune of the country, the production could not for some time be restored to even the low level of the post-war normal scale. Thus it can only be anticipated that the position in respect of coal stocks at gas-works will be far more critical by the 24th inst.—the day previously appointed for the opening of the annual meeting—than it is to-day. Even now, apart from the official restrictions in regard to gas supply and consumption, various gas undertakings have been compelled to curtail their output very seriously. In the circumstances, responsible gas engineers will not care to be absent from their works at the present period of extreme gravity. The programme that had been arranged for the annual meeting was a highly attractive one; and there was the supervening pleasure that the British gas profession would have had in welcoming their colleagues of the French gas profession. It is understood that the Committee of the Société Technique du Gaz will be meeting to-morrow to consider the position. But the whole of the arrangements, we hope, are only deferred, and not sacrificed. Our sympathies are particularly with the President (Mr. Thomas Goulden, M.Inst.C.E.), who has been devoting himself energetically to the preparations for the meeting, notwithstanding the extra heavy responsibilities imposed on him through the coal strike, as Chief Engineer to the Gas Light and Coke Company. The question as to what was best to be done in regard to the meeting, and the visit of our colleagues of the French gas profession, has been one of great anxiety to him. But, we are sure, the view throughout the gas profession will be that the decision of the President and Council is the most prudent in the circumstances of the day. Apart from fast dwindling coal stocks, railway travelling is bad. When peace is restored, and matters have again settled-down comfortably, the annual meeting can be held with a feeling of complete security as to gas supplies at home, and the full measure of profit and pleasure under happier conditions will then, we may well venture to hope, be extracted from the programme.

Drifting.

So far as could be seen by an inspection of what openly transpired, last week was spent by the Miners' Federation and the coal owners in marking time and allowing matters to drift. To permit things to drift means that the end must come (though the process may be slow) by the collapse of one side or the other. There was much talk of peace moves; but up to the end of the week, there had been no materialization, though it is perfectly obvious the Government, members of Parliament, the whole country, and labour leaders identified with industries suffering from the obstinacy of the Miners' Federation over the political issue of a national pool or its equivalent, are anxious to see an end to the present obstruction to the country's progress and normal movements and conveniences. There was some talk of arbitration; and the names of Lord Milner and Sir Arthur Duckham were mentioned. But inquiry showed (this at the end of the week) that officially the Miners' Federation had given no hint of any preparedness on their part to accept arbitration; and the coal owners would have no arbitration in which the question of a national pool had part. This is a fundamental principle which affects the general management of the coal industry, and so can only be decided by the industry itself. And the coal owners are as strongly opposed to it as the miners' leaders (if not the miners themselves) have been strenuous in their advocacy and adherence to it. A slight concession was made by Mr. Herbert Smith, the acting President of the Miners' Federation. He says: "If a pool is the wrong thing to talk about, "let the Government or the Press put down something else "that will give the miners equal opportunities, and the "miners will not stay out another minute." This means a pool or its equivalent. Such a pool is a proposal that has never been applied to industry in this or any other country, apart from Government control during war time, and under altogether different conditions. And a national pool suggests national control, as well as an immense amount of machinery for collecting and administering it. The nation is not disposed to have anything to do with this, nor to see anything introduced that is going to act as an interceptive agent to the free working of the economic system of the country, or to inaugurate something which (introduced in the mining industry) would be quickly used as a "bone of "contention" in other industries. The Miners' Federation want the Government to force this matter; and though they disclaim all intention of making it a political issue, the means which they would apply to gain the end make it one all the same. The nation and the Government are not minded to surrender to dictation by the Miners' Federation, nor to increase the subsidy of 10 millions which was offered with the sole object of tiding-over the present period of trade depression.

The stoppage has lasted nearly six weeks now; and the Government proposal as to a subsidy is less than a moiety of the sum of the wages that has been lost by the miners through the stoppage. It amounts now to something like 24 millions sterling, or the equivalent of 1s. 6d. per shift over a twelvemonth. In addition, the strike funds in many districts have been exhausted; and another appeal has been

made to labour throughout the country—labour in work—to support the miners. But labour outside the mining industry has its own troubles, and a considerable part of these troubles is due to the action of the Miners' Federation. Meanwhile, among the miners themselves—among the older and the more staid ones—there is a growing feeling that there is a more direct way of replenishing their pockets without recourse to the trifling aid that can be obtained by the benevolence of outside workers, and that is by getting back to work themselves. Reports show there is a movement spreading by which considerable numbers may return to work, although from other fields the intelligence comes that, though there is no ardent feeling over the question of the national pool, the men would hold out as long as the Federation bid them do so. Circumstances change; and it would be a persuasive circumstance to those holding-out to see others who returned to work enjoying the proceeds of their labour. There were ample indications at the week-end that the miners' leaders were getting more than anxious regarding their ability to keep the rank-and-file in a state of solidarity; and there has been revealed some internal dissension. The week has also caused a rapid growth of the view that a ballot of the miners should be taken to ascertain whether they desire to stand-out upon the question of a national pool, or are prepared for a renewal of negotiations on the question of wages only. The longer a ballot is delayed, the more likely (if one be taken) is it to go against the Miners' Federation. Through the duration of the strike and the doubtful time of its ending, the Government have had to put into force more restrictions, the railway companies have had to reduce further their train mileage, and other industries have had to send, and that reluctantly, more of their employees to join the ranks of the unemployed. It was interesting to learn from an official quarter on Saturday that since the economy measures were instituted, the weekly consumption of coal on the railways has been reduced by over 50 p.ct., and that used in the generation of electricity by upwards of 20 p.ct. There has also been a considerable saving in the quantity of coal used by gas-works; but the economy in coal used for water pumping is only just over 2 p.ct. The authorities appeal for immediate economy in the use of water, in order that more coal may be saved at the pumping-stations.

Coal is reaching this country from the Continent and America. But again the fiat has gone forth from the Transport Workers' Federation that all sections engaged in the loading, discharging, and manning of ships conveying the coal from abroad to Great Britain are to refuse to work the coal in any way, and from the National Union of Railwaymen that, if the Government break through the embargo of the Transport Workers' Federation, the railwaymen are to refuse to move the foreign coal, "which is first of all "imported to defeat the mine workers, and by the use of "blackleg labour is designed to overcome the loyalty of "the transport workers to the Miners' Federation." There are large numbers of railwaymen who will see the foolish attempt at deception there is in the quoted passage. The imported coal is not "first of all imported to defeat the "mine workers," but is intended to assist in relieving the suffering there is throughout the country owing to the extraordinary demands of the Miners' Federation. So far as the railwaymen are concerned, the decision is a reversal of the policy laid down in the resolution noticed last week, which made the embargo applicable only to coal intended for commercial use, and not to that for domestic and public utility purposes. The Government, however, are going to see that the coal that arrives at our doors has admittance; for they cannot allow sections of workers to prevent the country obtaining such succour as it can receive now that the fuel position has become so desperate. There are, we should imagine, few railwaymen and transport workers who are destitute of humane considerations. From the condition of their own coal cellars and scuttles, they know the position of things in the households of the country generally; they know the price that has to be paid for a few pounds of the precious material when it can be purchased; they know how their own fellow-employees are suffering through the enforced shrinkage of work. Fortunate will be those gas-works that can get some of the imported coal to stave-off the exhaustion of their stocks. Every day makes the position of gas-works more serious. The Order in Council last week as to water-gas making, and the instruction of the Mines Department as to the rationing of gas coke to industries, tell a plain tale.

Water Gas in the Current Emergency.

The Carbon Monoxide Committee have before them a generous amount of evidence, which assures all who consider it carefully that carbon monoxide in gas is something that is of considerable economic utility to the user, and that there has been much ado about nothing on the part of those nervous individuals who think there should be a curb put upon the proportion of this constituent in gas in view of its toxic property, which is only harmful when let loose from its confinement in pipes. Experience refutes the suggestion that there is any more risk in this than in many other things with which the human species has to deal in everyday life. The hyperbole of the appellants for restriction has had a very large amount of contradiction in the events of the past few years, and more so to-day than ever. Here we are with the country becoming everyday nearer destitution in regard to coal; and what is the result? There comes an Order in Council, through the Board of Trade, which imposes upon all gas undertakings the duty to utilize their water-gas plants to their fullest capacity (irrespective of the percentage of carbon monoxide distributed), and only to manufacture coal gas to the extent necessary to supply the deficiency. That is to say water gas, with its carbon monoxide content, is in this time of emergency (as far as possible) to take the place of coal gas, and coal gas that of water gas. Coal gas is only to supply the deficiency in water gas, although the deficiency may be a larger volume than the available water gas. This is a complete reversal of practice, due to a grave emergency. But when the coal-pits are yielding, every day sees our coal resources so much the less; and every day the need grows for everything being done to utilize our knowledge to the better utilization of coal. But the carbon monoxide restrictionists would prevent this in the pursuit of what experience asserts to be nothing but a fad. However, the Order is one that must be obeyed, and conditions are such that there is no way of evasion. This is only one among other instructions that were issued during last week owing to the coal strike. They are noted in a later column.

The Robinson Mixed-Gas Plant.

Week by week the evidence accumulates of the enthusiasm of the technical workers of the industry in investigating developments for deriving in the form of gas more B.Th.U. from the raw material employed, in preference to enlarging the production of coke. This was remarked in last week's "Journal." It will be seen again in the present issue; for complete gasification by two different processes was the primary product of the meeting of the North of England Gas Managers' Association on Friday last. Our columns have previously acquainted readers with the experimental work that Mr. Frank H. Robinson has been carrying on at the Harrogate Gas-Works, and which is meeting with so much success; and his paper at the North of England meeting fills in information that was not formerly available, and shows that accruing experience is enabling him to define the best practices to be followed in operating the system. From the thermal point of view, in developing complete gasification—complete gasification in a dual process in which the tar oils and ammonia are preserved—there must be utilized the heat of the incandescent coke that comes from the coal-gas retorts; and the question is how best to accomplish this in practice. The tar oils and the ammonia cannot be saved without there are two distinct processes, though united more or less closely. Hitherto, in making coal gas in retorts, quenching the spent charges, losing the considerable amount of heat of the incandescent coke, producing breeze, and calling for labour and plant in carrying part of the coke to water-gas generators more or less distant from the coal-gas retorts, waste has been involved. But now we have processes that aim at bridging-over the wide division between the coal-gas and the water-gas systems, and to eliminate the obvious uneconomy that the older practice entails, though circumstances will necessitate its continuance for some time to come. Mr. Robinson has been solving the problem in one way at Harrogate, and Mr. A. A. Johnston in another way (as seen in our issue for April 20) at Brentford. It may be that as time passes, one process will be utilized for smaller and medium-sized works, and the other for the larger works—that is, where a mixed coal and water gas is preferred. But at present more information is wanted. No one can be quite positive in the absence of necessary data.

The Harrogate plant is a horizontal retort-setting with a

water-gas generator at one end; the whole combination being accommodated within the area of the retort-bed. The number and arrangement of the retorts can be varied to suit local circumstances; but the grate area of the generator must be proportional to the length, number, and size of the retorts. At the discharge end of the retorts is a large chamber above the generator, through which the coke from the retorts is fed direct into the generator. The chamber has also the very definite purpose of retaining the coal gas made during the blow part of the cycle of operations; and from it, on the blow being changed to a run, the coal gas is swept back by the water gas through the retorts before any is wasted. Mr. Johnston's method of utilizing the heat of the spent charges, it will be remembered, is to have a water-gas plant *vis-à-vis* with retort-settings, and to bridge the short distance between with a telpher and skips, so transferring in less than a minute the incandescent coke to the water-gas generators. In his case, too, he generates the steam required for water-gas manufacture from the water-gas plant itself—thus making it practically self-contained; and so saving fuel. On the other hand, Mr. Robinson, in his small combined plant, utilizes the blow gases for the heating of the retorts, which enables practically the whole of the coke to be utilized for water-gas production. No flame appears at the stack-valve, as in most water-gas plants; the whole of the carbon monoxide being consumed in the setting. It is quite obvious that this method of working must result in an economy of fuel. Furthermore, the water gas passes hot through the coal-gas retorts up the ascension-pipes, and so the two gases commingle in their hot crude state. There are good points about both systems; but preference between them will always be settled by local circumstances, including capital costs. However, Mr. Robinson has not got to the end of his research and developments. His next move will be to make the plant practically automatic—the same as ordinary water-gas plants can, by electrical operation, be made to-day. But already the combined plant, as operated at Harrogate, is a proved practical unit in gas making. However, extent of operations will come into the question, and may exert some limit to application. There are points that require to be explored comparatively with (say) such a system as that being practised at Brentford. Mr. Robinson, as his paper shows, is doing excellently with the production of therms per ton of coal. What investigators will want to know is how small mixed-gas-producing units each with its water gas-generator (so requiring a larger number of generators) will stand relatively, in respect of capital, labour, and all other costs, with the system as introduced at Brentford. There are economical advantages, as seen, in both; but, whatever the system adopted, the determining factor must be the cost per therm.

The coal gas in the Harrogate combined plant is produced at a comparatively low-temperature, and so a thin tar is yielded, which is at no time cracked, because the water gas sweeps the coal gas forward to the ascension-pipes as quickly as it is evolved. The plant lends itself to operation in various ways, and its elasticity in this respect enables gas of whatever quality desired to be produced. It is all a question of operating methods; and to the methods and the results produced by varying them, Mr. Robinson has been devoting a great deal of attention, so much so that it is apparent he can make the plant answer readily to requirements in respect of quality, though variations have some influence on the volume of inerts. But nowhere in the paper with normal working do we find the inerts of excessive amount. According to the system of working, they may be over 20 p.ct., or down to about 13 p.ct., with in both cases mixed gas of approximately 400 B.Th.U.—to be exact, 396 and 394 B.Th.U., with the coal used and under the Harrogate conditions. Care is taken not to have the steam pressure too low, as otherwise the CO_2 is increased at the expense of the CO. The line of working aims at keeping the CO_2 somewhere between 6 and 8 p.ct. But if the fan is run at a steady speed, and the steam supply to the generator is limited, a gas containing not more than 3½ p.ct. of CO_2 can be obtained. In one test, carbonizing in twenty hours 2·8 tons of coal, Mr. Robinson obtained a make of 55,000 c.ft. of 344 B.Th.U. gas, which is equal to 18,920,000 B.Th.U. per ton, or (not reckoning anything for the tar), 63·1 p.ct. of the heat value in the coal. There is much good result in the paper; and we hope that its encouragement will lead to continued investigation, and ultimately to a good place of utility for the Robinson mixed-gas plant in the system of gas-works operations.

Further Experiences with the Tully System.

A PAPER which is a companion one to that read by Mr. Robinson was that of Mr. C. H. Chester, F.C.S., treating of the principles of the Tully plant, and its adaptation to modern gas-works practice. There are places in which the gas from the Tully plant is used "neat;" but in this paper the subject is treated from the point of view of the utilization of the plant in conjunction with coal-gas settings for the supply of a mixed gas—the plant, in fact, lends itself to use as a gas-producer, water-gas set, or suction-gas producer. From what Mr. Chester says, it is clear that improvements have been made in details of the plant as a result of the experience gained under new conditions of operation in different works, and which improvements have conduced to further smoothness of working, and to reduce damage to the interior of the producers. Although, in the Tully plant, the retorts in which the coal undergoes preliminary distillation are superimposed on the generator, there are general working principles that are somewhat akin to those in the Harrogate process. This, of course, cannot possibly be avoided.

As is mentioned in the paper, the distillation of the coal is accomplished first by the heat generated by the combustion of the waste gases, and, secondly, by the passage through the coal charge of the hot water gas, the temperature of which is approximately 1000° C. However, at this time of day, the principles of the Tully plant are well known to technical gas men; and the more they have been investigated, the larger has been the adoption of the plant. The working results are the part of the paper which interest us most, as Mr. Chester has gone to some pains to incorporate the workings from different plants operating with dissimilar coal, and has given analyses which add to the technical interest. Approximately speaking, the yield of gas from a Tully plant (varying, of course, with the coal and the quality of gas made) may be taken as being 60,000 c.ft. when the calorific value is 340 B.Th.U. per cubic foot. This gives a multiple of 20,400,000 B.Th.U. These figures are more than confirmed by results from Scunthorpe.

However, the paper deals with the use of the plant as an auxiliary to coal-gas plant. Some cost results are given from a Scottish gas-works making 70 million c.ft. of gas. In this case, the Tully plant is only working on about an average of twelve hours a day, so that the maximum efficiency is not realized. The coal gas and the Tully gas are mixed in the portions of 55 p.ct. Tully gas and 45 p.ct. straight coal gas; and the quantity of mixed gas sold per ton appears to be 19,570 c.ft. of 490·7 B.Th.U. Mr. Chester gives a table which shows that the cost of coal and labour, less residuals, for Tully gas is 10·6d. per 1000 c.ft.; 24·08d. for straight coal gas of 575 B.Th.U.; and 18·9d. for mixed gas of 490·7 B.Th.U. Deducting the cost of the mixed gas from that for the straight coal gas, he says the net saving by the new system is 5·18d. per 1000 c.ft., after allowing for fuel for steam-raising. There is not the slightest use in these days presenting figures showing the saving per 1000 c.ft. without having regard to calorific value. Taking Mr. Chester's figures, we calculate that the cost of Tully gas is 2·8d. per therm; of the straight coal gas 4·18d. per therm; and of the mixed gas 3·85d. per therm. These calculations put the relative prices upon a really comparable level.

Reverting to the cost on the 1000 c.ft. basis, there would be a further difference now that there is a slump in residuals, and to the advantage of the Tully and the mixed gas compared with the straight coal gas. However, if we are right in taking 11,000 c.ft. as representing the production of the 575 B.Th.U. straight coal gas, and 19,570 c.ft. of 490·7 B.Th.U. for the mixed gas, there would be only 63·2 therms for sale with the straight coal gas, and 95·8 therms with the mixed gas. The Scunthorpe figures show, using 41·8 p.ct. of Tully gas in the mixed gas, that there are 97·9 therms for sale per ton of coal—the gas having a value of 476 B.Th.U. per cubic foot. The inerts only total to 12·4 p.ct. The coke for sale per ton of coal (including the coke used for steam-raising) is 7·57 cwt.; and tar, 10·58 gallons. These figures have confirmation in the paper by Mr. F. A. West, as published last week. The general characteristics of the tar (as disclosed by analyses made by Dr. Lessing) are those possessed by the tar from low-temperature carbonization. Mr. Chester's paper is a highly interesting one; and it corroborates, from fresh conditions of working, the results realized by the system in other places.

Is the Hot-Coke Conveyor Doomed?

In this week's issue there is an illustrated article descriptive of the changes which the Engineer and General Manager of the Brighton and Hove Gas Company (Mr. C. H. Rutter, M.Inst.C.E.) has been making at the large manufacturing station at Portslade. The work is extensive and important in several features. But it raises a question, Is the hot coke conveyor doomed—the hot coke conveyor that runs the full length of a horizontal retort-house, and does a small amount of work in relation to time and its length? The answer will greatly depend upon the situation of the house and the position of the bench to the coke-yard. Where the coke-yard is end-on to the retort-house, and cannot be otherwise, then the hot-coke conveyor will continue. But where the coke yard runs parallel with the retort-bench, then we rather think, from what was witnessed at Brighton (and can now be seen elsewhere), that the coke-transporter, and the transfer of the incandescent coke immediately through windowways in the side of the house to an inclined bench outside for quenching and cooling, will become more and more favoured. Through the quenching being done outside, the retort-house is kept free of steam, fumes, and dust; the house continues in a cleaner condition; the atmosphere is maintained in a wholesome state; there are no coke droppings littering the basement, and no dripping water to make things uncomfortable for the firemen. The coke is large, and very little breeze is made; the quenching water has an opportunity to drain from the coke; and the water is collected, re-pumped, and re-used. The costs of repairs and maintenance of the plant and of the labour are low. It seems wrong to have a long length of coke-conveyor running to carry at one time a spent charge of a few hundredweight if there is another means of expeditiously and cheaply doing the work. The answer to the question at the head of this paragraph is that it depends on circumstances; but the coke-transporter has done something to limit the market for the hot-coke conveyor.

Railways and their Workers.

It was the pleasure of Sir Eric Geddes to announce in the House of Commons the other night that the railway companies and the unions representing the workers had arrived at a considerable measure of agreement with reference to the share of the latter in the management of the railways. Representation on the boards of directors has now been abandoned; but the officials and workmen are to be represented on bodies which are described as councils for each railway or group of railways. The functions of these councils will be generally as defined in clause 16 of the Whitley report on Industrial Councils; but they will not be Whitley Councils in the ordinary sense. The Councils will exercise general supervision over the conditions of employment, but will take no part in the adjustment of wages, inasmuch as the existing Central Wages Boards and the National Wages Board are to be continued. A joint committee is to be set up forthwith to prepare the necessary scheme. The Unions attach the greatest value to the retention of the Central and National Wages Boards, because it is considered these will ensure the continuance of wages adjustment on a national basis, and remove a great deal of anxiety and uncertainty among the rank-and-file of the men as to the possible position when the railways are decontrolled in August. Such a patron of the railways as the gas industry is glad to hear of any reasonable endeavours that are made to prevent the interruption of the railway services of the country.

Manchester Gas Scheme—No Rate Relief.

There are several interesting points about the Manchester gas scheme which was recently before a Lords Committee, and the proceedings before whom were reported in the "Journal" last week. The Manchester Gas Committee, headed by the progressive Lord Mayor (Alderman William Kay), have adopted an entirely sound economic policy in accepting the advice and plans of Mr. William Newbigging for constructing new gas-works, instead of trying to patch-up more than is necessary and to extend for service some distance ahead (if that were possible) the separate stations now existing in Manchester. The ultimate capacity of the new works will be 40 million cubic feet; and the first section, which will involve an outlay of £1,640,000, will have a capacity of 8 million cubic feet. The scheme received the endorsement of Mr. W. Doig Gibb. The proposals of the Bill include the purchase of the Stretford Gas Company's undertaking; but the District Council came along and objected, for the reason that they wish to remain, even in the matter of gas supply, masters in their own house. It was the action of the Manchester Corporation that evoked this ambition; but it does not appear to have entered into the minds of these guardians of local interests as to whether the consumers of gas would be better off in pocket by becoming the customers of the Manchester Corporation or the Stretford District Council. This was a point that was altogether outside the ambit of their consideration. It is a point the gas consumers should not lose sight of in view of probable coming events. Will it be more to their advantage to patronize the shop of Manchester or that of Stretford? Why we suggest they should not lose sight of the matter is that if, in the next session of Parliament, Stretford, in conjunction with one or more other Councils in the area of the Stretford gas supply, ask Parliament to confer upon them powers to acquire the undertaking, they can do so without the Corporation of Manchester opposing, other than to protect their own interests. This means that the Manchester Corporation will not be able to speak up for Stretford consumers, so the Stretford consumers will have to speak up for themselves. The agreement effected provides for clauses insisting upon uniform gas prices with Manchester throughout the new area of supply (we take it this means for identical purposes and quantities), and prohibiting the application of gas revenue to the relief of the Manchester rates. These are important features, especially with Manchester the subject of them.

Semi-Nationalizing of Industry.

The opposition to the Electricity Supply Bill No. 2 is gathering strength as the days pass; but the measure appears to have again got stuck in the mud. Many Ratepayers Associations and Chambers of Commerce have been aroused, or where they have not been they are being shaken and awakened to the position that the Bill proposes to create. There is a call to these organizations to enter their protest against the "irregular semi-nationalizing of industry" by the Bill, which contemplates the financing of joint electricity authorities on the security of the rates. Writing on the Bill, the Secretary of the Provincial Electric Supply Committee of the United Kingdom says a serious precedent is being created in the proposal to constitute bodies totally unknown to local government to carry on speculative trading with the ratepayers' money. And he adds: "These joint electricity authorities are empowered under the Bill to raise enormous sums of money for schemes which are distinctly speculative. Parliament has no direct control over these bodies, neither has the ratepayer. The present issue is not one between municipal trading and private company trading—in fact, so far as the present Bill is concerned, their interest as individual undertakers would seem to be almost identical. The question is whether the system of semi-nationalization is to take the matter out of the hands of municipal undertakings and company undertakings alike. From an electricity supply point of view, the proposals of the new Bill are quite unnecessary."

Waverley Association of Gas Managers.—The annual meeting of this Association will be held in the Public Library Hall at Hawick on Thursday, the 9th prox., at 11 a.m.

Society of British Gas Industries.—We learn from the Secretary (Mr. Arthur L. Griffith) that the annual general meeting will be held at the Hotel Cecil, London, W.C., on Wednesday, June 15, 1921, under the presidency of Sir Arthur Duckham, K.C.B. The programme of arrangements for the meeting will be announced later.

French "Professional Syndicate."—There has been received a large volume containing all the literature that was distributed to the members during the year 1920 by the French "Professional Syndicate of the Gas Industry." It forms a permanent record of extensive and useful work in connection with the many matters in which the Syndicate is interested.

Utilization of Blast-Furnace Gas.—In a paper submitted at the annual meeting of the Iron and Steel Institute, Mr. S. H. Fowles said that waste gas and heat must be used at the maximum efficiency. To use the gas under boilers, whether from coke-ovens or blast-furnaces, is a barbarous practice. Therefore we must cultivate the internal combustion engine. This must be borne in mind when selecting a cleaning plant: and all the details must be taken into consideration carefully. The internal combustion engine is fast proving its value as an economical and reliable prime mover, and is improved considerably when supplied with clean dry gas. This means that the *crux* of the whole business rests with the gas-cleaning plant, which has been proved beyond doubt to be the case. Blast-furnace and coke-oven owners should be encouraged by engineers to work for a maximum efficiency on the stoves and a maximum surplus of gas for the generation of power, which would thus become a great national source of cheap energy.

PERSONAL.

In connection with Mr. SAMUEL GLOVER's retirement after half-a-century of service, there was a gratifying ceremony in the Mayor's Parlour at St. Helens last Wednesday, when Alderman Crooks (who has long been Chairman of the Gas Committee) called upon the Mayor to make a presentation of an inscribed gold watch to Mr. Glover and a handsome silver salver to Mrs. Glover. The inscription on the watch was: "County Borough of St. Helens. Presented to Samuel Glover, Esq., M.Inst.C.E., by members of the Council on his retirement after fifty years' faithful and efficient service, as a mark of appreciation." The Mayor remarked that it was one of the most pleasant duties that had ever fallen to his lot. He suggested that Mr. Glover should not make his retirement too deep, and expressed the hope that Mr. and Mrs. Glover might have many years of happiness, with every joy and health. Mr. Glover said that he was very much touched to find he had been able officially to give satisfaction for so many years. It was very gratifying, especially when he found that he had been able to live an official life in such a way as not to estrange those who had been over him in the position of representing the Corporation. He thanked them very much for their present, and said it would always remind them of the Council's great kindness. Mrs. Glover, in a few neat sentences, also expressed her thanks for the handsome present the Council had given her.

Mr. ERNEST SCEARS, on leaving to take up the position of Engineer to the Redhill Gas Company, was presented by the staff and employees of the Rugby Gas Company with a pair of silver entrée dishes, a case of silver fish knives and forks, and a silver cigarette box; the presentation being made by Mr. R. J. Meiklejohn, the Engineer and Manager. Mr. Scears was articled to Mr. W. E. Price, and was afterwards Assistant Engineer and Manager under him to the Hampton Court Gas Company. In 1914 he went to Rugby as Assistant Engineer and Manager. While at Hampton Court, Mr. Scears was for several years Hon. Secretary of the London and Southern District Junior Gas Association, and acted as Abstractor to the Institution of Gas Engineers. He was also a recognized City and Guilds of London Institute Lecturer in "Gas Supply," at Kingston, Acton, and Chiswick, and Guildford Technical Institutes.

Mr. FRED PEEL, for the past four years Assistant Engineer and Manager to the Brighouse Gas Department, and the Hon. Secretary of the Yorkshire Junior Gas Association, has been appointed Gas and Water Engineer to the Tyldesley and Shakerley Urban District Council. Mr. Peel, who served his time in the drawing office of the Bradford Corporation Gas Department, and was Assistant District Superintendent there for two years, is one of the most popular of the younger end of gas officials in Yorkshire. He holds first-class honours of the City and Guilds for "Gas Engineering" and "Gas Supply," and first-class certificates in practical, theoretical, and inorganic chemistry, practical mathematics, building construction, draughtsmanship, engineering, mechanics, and commercial subjects.

Among the members elected last month to the Society of Chemical Industry was Mr. JOSEPH HARGER PYE, Engineer and Manager to the Clevedon Gas Company.

It was announced by the Chairman, Mr. JULIAN L. BAKER, at last week's meeting of the London Section of the Society of Chemical Industry, that his term of office would close next month, and that Mr. E. V. EVANS, Chief Chemist to the South Metropolitan Gas Company, had been elected by the Committee to succeed him.

OBITUARY.

Mr. W. J. STURGES, who had been Secretary of the Smethwick Corporation Gas Department for the past forty years, passed away, after a short illness, in the early morning on the 8th inst. The funeral takes place to-day.

The death occurred on the 2nd inst. of Mr. HENRY HAWKINS, who in 1906 left Todmorden to take up the position of Gas Engineer to the Limerick Corporation. He was succeeded at Limerick by Mr. J. E. Enright in 1918.

Mr. HENRY TALBOT, who just three months earlier had retired, after 55 years' service, from the position of Chief of the Public Lighting Department of the South Metropolitan Gas Company, died on the 1st ult. at Weston-super-Mare, where he was residing with his daughter and son-in-law.

The annual meeting of the Association of Statutory Inspectors of Gas-Meters will be held, under the presidency of Mr. J. Ollis, in the County Hall, Spring Gardens, S.W., at 11 a.m., on Wednesday, May 25. At 2.30 p.m. there will be a conference of members and of representatives of authorities administering the Gas Measures Acts, at which the President of the Council (Mr. G. Hume) and Mr. S. B. Langlands, of Glasgow, will introduce a discussion on the working of the Board of Trade Gas-Meter Regulations, 1920.

LIGHTING AND FUEL RESTRICTIONS.

New Emergency Order.

IN the "London Gazette" for the 3rd inst., there was published an Order in Council by which it is provided that the Board of Trade may direct in what ways coal shall be used and may fix the price. The Board may also order that all lights of any specified class shall be extinguished or restricted in places of entertainment, hotels, and clubs. The text of the Order on this point is:

The Board of Trade may by order direct that all lights of any specified class or description shall be extinguished or their use restricted to such extent, between such hours, within such area, and in such places of entertainment, hotels, clubs, or other premises as may be specified in the Order; and if any person having control of any light, or occupying or having control of, or managing, or being in charge of, premises in or in connection with which any light is used, acts in contravention of any such Order, he shall be guilty of an offence against these regulations.

Coke for Industry.

A circular-letter from the Mines Department to local authorities in the Metropolitan fuel area says that it has now become necessary to prohibit further supplies of gas coke to industrial concerns, except under permits granted by the local authority. The local authority may issue such permits in suitable cases for quantities up to 5 tons a week; but permits should not be issued for larger quantities without the consent of the Metropolitan Emergency Coal Committee.

Water Gas to be Utilized to the Fullest Possible Extent.

An intimation by the Mines Department of the Board of Trade appeared last Thursday, to the effect that, with the object of ensuring the maintenance of supplies of coal as long as practicable for food-producing concerns, public utility undertakings, and other essential services, it has been decided to impose (among others) the following further restrictions on the consumption of coal, gas, and electricity:

1.—All gas undertakings which have the means of making gas from steam and coke, including the making of carburetted water gas, are prohibited from using any coal for the manufacture of coal gas until they shall have supplied to the fullest possible extent the permissible requirements of their customers by means of water gas.

2.—Subject to the requirements of the police for the maintenance of public order, the consumption of gas and electricity for street and public lighting is—

(*a*) To be reduced to 25 p.ct. of the quantity used at the corresponding date in 1920 in the case of townships or boroughs of which the population is not less than 5000, and

(*b*) Discontinued in the case of other districts.

3.—The supply of power generated by the use of coal to tramways and light railways is to be forthwith restricted to 75 p.ct. of the average daily quantity used in the week ended April 9, 1921.

The necessary orders to give effect to these restrictions have been made under the Emergency Regulations.

Sleeves for Under-Water Mains.

From a gas consumption standpoint, the River Fox about evenly divides the City of Green Bay, through which it runs. Growing demands made it necessary to supplement the existing 6-in. cast-iron main under the river; and it was decided to lay a 12-in. steel main, the method adopted being explained by Mr. William F. Miller, in a paper read before the Wisconsin Gas Association. Standard pipe was used, weighing 49 lbs. per foot, and was cut in 20-ft. lengths, threaded at both ends. These lengths were connected by special river sleeves, constructed as follows: A 12-in. steel coupling 5 in. long is employed as a core for a cast-iron sleeve. A rubber gasket and a malleable iron follower slip over the ends of the pipes to be connected—one on each end of the sleeve. The rubber gasket, 1 in. wide by ½ in. thick in cross-section, has a triangular groove cut in the side next to the sleeve, and a bevel on the side next to the follower. These gaskets are tipped with canvas to protect the rubber from decomposition by contact with condensates. The followers are bolted to the sleeves by sixteen ¾-in. machine bolts, eight on each end, to draw up the gaskets. This makes a double joint, consisting of the screw coupling and the two gaskets, which is absolutely gas-tight. The weight of the sleeve is 275 lbs. The site selected for the main was at a point where the river is approximately 1100 ft. wide. A foot of 12-in. pipe weighing 49 lbs. displaces 55 lbs. of water; so that a force of 6 lbs. per foot would be exerted upward when the pipe was immersed. A "Dresser" sleeve weighing 275 lbs. displaces 155 lbs. of water; and therefore a resultant force of 120 lbs. would act downward on each coupling, or 6 lbs. per foot on a 20-ft. length. This meant that the main would float. To submerge it, it was partially filled with water; and afterwards the main was weighted at different points. A close approximation of the cost of the completed main is $16·5 per foot.

PARIS REVISITED.

Progress in Cooking by Gas—A New Boulevard Restaurant.

By A. P. MAIN.

ON one of the finest sites in the centre of Paris, and immediately to the east of the Great Church of the Madeleine on the Boulevard des Capucines, there has just been completed what is probably the most imposing and luxurious restaurant in Paris—the Restaurant Vignon. Having heard from a friend that the cooking in this latest restaurant was entirely done by gas, I mentioned the matter to M. Bertin, of the Paris Gas Company, who very courteously placed at my disposal one of his Engineers (M. de Saint-Pol), in whose company I was privileged to inspect the three kitchens that supply the Table d'Hote Restaurant, the English Grill-Room, and the Restaurant. At the period of our visit the staff were busily occupied in preparing luncheons; so that I had the opportunity of observing the apparatus at work.

Following the practically universal custom in France, the bulk of the cooking is done on a large central range, which was entirely operated by gas, with the addition of gas grillers and pastry ovens. In the English grill-room the English plan is adopted of allowing the customers to choose their chops and steaks. A large double gas-grill is installed. Above each grill is fitted a hot closet for warming plates and keeping dishes hot; the hot closets being, of course, heated by the waste gases from the grill beneath.

The kitchens, which are on the same floor as the rooms which they supply, are admirably lighted and ventilated. It will be difficult to find in London anything to equal them in this respect. The interior decorations of the restaurant are in the Empire style, and, needless to say, are carried out with the greatest artistic taste by the well-known firm of Au Printemps, of the Boulevard Haussman.

There is a flat roof on the top of this imposing building, from which an extremely fine view can be obtained over the surrounding district. What impresses one here is the fact that the whole of the products of combustion are carried off by four galvanized flues about 6 in. diameter, with an entire absence of smoke.

The French chef has always been extremely conservative in the matter of the apparatus which he uses for the purpose of his fine art of cookery, and readers of the "JOURNAL" will be interested to learn that in the very latest and finest of the Paris restaurants gas has entirely supplanted coal for cooking. The chef assured me that the whole of the apparatus was giving the utmost satisfaction. M. de Saint Pol, who was responsible for the organization of the gas supply, has carried out the work with great ability.

I felt much indebted to M. Bertin and M. de Saint Pol for the opportunity so readily given me of seeing this latest development of gas cooking in Paris. Gas is making great strides, both for cooking and heating, throughout France, not only in restaurants, but in private houses as well. I had the opportunity of inspecting a very elegant flat occupied by a friend of mine at Monte Carlo; the whole of the cooking was done by gas, and a geyser supplied the hot water. From the window of my bedroom in the Hotel Continental in Paris I could still look out on the myriad gas-lamps in the Champs Elysées. Bearing in mind the terrible strain of the war, which came almost to the gates of Paris, one cannot expect to find the city yet restored to its former lightness and gaiety; but it requires only a few years for the indomitable spirit of the French people to re-assert itself once more and to restore their beautiful capital to its wonted charm and brightness.

A Forthcoming Engineering Conference.—Arrangements have been made by the Institution of Civil Engineers to continue this year the series of conferences which were interrupted by the rebuilding of the Institution premises and the war. The conference will be held on the mornings of Wednesday, Thursday, and Friday, June 29 to July 1; the afternoons being devoted to visits to engineering works. For the purpose of the meetings the conference will be divided into seven sections—one of which will deal with "Water-works, sewerage, and gas-works," and another with "Electricity works and power transmission."

Protection of Iron with Paint.—In a previous paper presented to the Iron and Steel Institute, Dr. J. Newton Friend, F.I.C., drew attention to the superiority of polymerized linseed or litho oils over raw oil for the protection of iron against atmospheric corrosion. This, he said in a further paper at last week's meeting, is attributable in part to their diminished permeability towards water, but mainly to their greater stability—polymerization resulting in the saturation of their double bonds, thus rendering them less liable to oxidation and disintegration upon exposure. On the other hand, an ordinary boiled oil is partially oxidized in the process; and, particularly if a drier be present, a marked increase in the rate of setting is observed when the oil is spread as a paint film upon a suitable surface. One of the main objects of the "boiling," indeed, is to increase the rate of setting. But the same catalysts which accelerate the setting or initial oxidation also accelerate the disintegration or slow further oxidation upon prolonged exposure to air. Hence, in contradistinction to litho oils, ordinary boiled oils will not as a rule offer as good protection to iron as the raw oil. Not only do two coats of paint protect from atmospheric corrosion more efficiently than one thinner coat, but they are even slightly more efficient than one thick coat containing the same weight of paint as the two together.

ELECTRICITY SUPPLY MEMORANDA.

UPON the hoardings of late, there have been large posters, and in other prominent positions smaller ones, which have urged all good citizens to "Save Coal," "Save Gas," and "Save Electricity."

A Case of Degree.

The "Save Electricity" was put at the bottom, and in smaller type than the "Save Coal" and "Save Gas," which were of uniform proportions and character. The electrical people will not be proud of the place they occupy on the posters, nor of the relative insignificance of the type employed to appeal for the saving of electricity. They may attempt to console themselves with the idea that perhaps the Government after all are indulging in the fallacious notion that the provision of electricity is the most economical use of fuel in existence, and so the less need for calling for its saving. But a "fool's paradise" is something that the world cannot afford to lose; otherwise there would be a remarkable increase in the proportion of vagrants. The reason why the "Save Electricity" was put into bottom place and in smaller type is that as a heating agent its popularity and use are not on the same level as coal and gas, and the degree of its use for such a purpose is something that the authorities felt they could almost ignore.

A Power Company "Top Dog."

A significant decision has been given by the Electricity Commissioners regarding the North Wales and Chester electricity area. There is to be no joint authority there with electric generating and transmission obligations. In the area a joint authority constituted of representatives of local authorities and other bodies who were prepared to accept financial responsibility failed to secure adequate support; and the scheme put forward by the Chester Corporation for the development of a series of low-fall water-power stations on the Dee, with a steam-driven station as a stand-by near the estuary of the river, has not found favour in the eyes of the Commissioners. They have been better impressed with the proposals of the North Wales Power Company, who have hydro-electric resources, and a scheme for their development together with steam-driven stations. To the Power Company the Commissioners have handed over the development of the entire area. This will be a nasty blow for the municipal authorities; but, on the other hand, the Company are not to have complete independence as to their operations. There is to be a joint authority—an amorphous and feeble sort of body—who theoretically are to take an intelligent interest in the development of the supply of electricity in the area, and act in a supervisory and consultative capacity. They are to keep an eye on the questions of the co-ordination of supply by the Company and other authorized undertakers in the area, and more especially in respect of the electrical development of districts without a present supply. Whether this scheme will be workable or not cannot be predicted. But dual control is an awkward thing, and as often results in friction as in harmonious relations. Some members of local authorities would give much to be in a supervisory office where they could make things uncomfortable for private enterprise.

The Plaint of the Small Company.

The small electric companies are in sore distress. Mr. P. D. Tuckett voiced their grievances at the recent meeting of the Urban Supply Company, Ltd. (which is a conglomeration of small concerns); and the electrical press have since been crossing his "t's" and dotting his "i's." There is genuine reason for complaint; just as there was not only in the case of the small, but in that of the large gas companies until legislation came which opened the road to a review of their charge and dividend powers. Of course, the electricity industry has not a sliding-scale under which to work; and many times, as the administrators and shareholders of the large companies have observed the decline of gas dividends and market values, they have fervently thanked goodness that they did not follow the example of gas companies, but stuck to maximum prices of a magnitude that kept their dividends at a snug figure. It is the small electricity companies that have suffered so painfully. The burden of costs has fallen upon them with a force that looked like crushing the life completely out of them; and even now they are not satisfied with 10d. or 1s. per unit. Their feeling is that they must live, and think about the future. "Starvation wages" will only weaken them, and leave them destitute of the means for extending their businesses. Investors cannot be attracted by dividends only three-quarters of the pre-war payments, or perhaps none at all, if the increases in price that are allowed will not produce the three-quarters. Public confidence has to be restored; but Mr. Tuckett holds that this can only be done by the Ministry of Transport or the Electricity Commissioners securing enlarged powers to do full justice to present holders of capital. Why is it that the large electricity undertakings have not been hit to the same extent as the small ones? Mr. Tuckett has given two reasons. He takes coal first. A large undertaking, using big turbine generating sets, consumes some 2 to 3 lbs. of coal per unit; whereas the small undertakings, with little reciprocating sets, cannot expect to consume much less than 5 or 6 lbs. per unit. The increased price of coal, therefore, hits them twice as hard as it does the larger com-

panies. Then as to wages. Before the war, as a rule, the men of the smaller concerns, under the pleasanter and easier conditions, were content to work longer hours at a considerably lower wage. But now that wages and working hours are regulated by the Joint Industrial Councils on a more or less uniform standard throughout the country, it has had the effect of increasing the wage rates altogether disproportionately, besides in some cases compelling the small stations to employ an additional shift. For example, where a large company was paying £2 before the war, the small company was paying a little more than £1 for a corresponding service; so that though the large companies may now be paying £5 against the £3 10s. of the smaller companies, the wages bill of the former has increased 150 p.ct. compared with 250 p.ct. in the case of the latter. For relief from their afflictions, the small companies do not look hopefully to the joint authority schemes. They foresee years of toil and waiting before they get cheaper electricity from such sources. Will they ever get cheaper electricity from them? Doubts are spreading luxuriantly.

Radiant Efficiency.

The "Electrician" is constantly "putting its foot into it" when dealing with the relative positions of gas and electricity. Referring to an article in the "New Statesman," it says that it embodies a "quaint conception" about electric fires, gas stoves, and radiant heat. The "quaint conception" also finds residence in the mind of our electrical contemporary. It points out that, while report No. 3 of the Fuel Research Board shows that the radiant efficiency of the domestic fire is 20 p.ct., and of the gas-fire 50 p.ct., recent experiments in the laboratories of the Metropolitan-Vickers Company show that the radiant efficiency of the electric fire is 60 p.ct. We should like some particulars as to how the Metropolitan-Vickers test was carried out, and as to the appliances used in making it. In testing for radiant efficiency scrupulous care and unimpeachable instruments are required for the purpose. Further, 60 p.ct. of what? Take a unit of electricity with a potential heat energy value of 3420 B.Th.U. This unit for heating purposes costs (say) 2d.—it may, and in many places does, cost more. The 60 p.ct. of the 3420 B.Th.U. represents 2052 B.Th.U. given off as radiant energy. For 2d. the South Metropolitan Gas Company supply consumers with 19,048 B.Th.U. Used in a gas-fire, 50 p.ct. of this heating power given as radiant energy (to say nothing of the convected heat) represents 9524 B.Th.U. In other words, 364 p.ct. more heat is supplied to a room in radiant form for a similar expenditure of money. When percentages are talked about for comparative purposes, regard must be paid to their bases. It is not Prof. Leonard Hill or the "B.C.G.A." who have to revise their opinions, but such writers as the one in "Electrician." They should revise the extent of their examination of this subject, which at present goes to a length so insignificant that it might be measured by any one of their nasal organs.

Trade Union Autocracy.

It is to be hoped that the Hackney Borough Council will take to a higher tribunal a case that has been before Mr. Forbes Lankester, K.C., at the North London Police Court. The Magistrate himself thinks this should be done, as it is a question of the interpretation of *force majeure*. The point is whether the expression covers a piece of arbitrary conduct by a trade union which, if permitted, would make business impossible in similar circumstances. The facts are briefly these: A would-be consumer named Dore summoned the Council for making default in supplying his private house with electric energy. A contractor named Cant working for himself, and who could not therefore belong to a trade union nor to the Masters' Federation because he did not employ any labour, carried out the work at Mr. Dore's house, and to the satisfaction of the Borough Electrical Engineer. But when they were ordered to make the connection, the employees of the Council, acting on the instructions of the Electrical Trades Union, refused to do so on the ground that the work was not done by trade union labour. The Council were therefore willing to supply current, but could not owing to the intervention of the trade union. At the hearing, it was contended on behalf of the Council that the refusal of the trade union to allow the connection to be made under threat that the trade union members would be withdrawn from the work was *force majeure* within the meaning of the Order, and that consequently the Council were relieved from responsibility. The Council had therefore to run the risk of yielding to the threat of the Union, or dislocate the electricity supply of the borough. Mr. Forbes Lankester held that, in view of the decided cases, he was of opinion that the default was not due to *force majeure*, and that the default could not be excused. He therefore fined the Council 5s. per day for nine days with 20 guineas costs, but not before he had expressed some well-merited views on the action of the Trade Union. He said that "the threat, if acted upon generally, would deprive all men in the position of Mr. Cant of an honourable and legitimate livelihood, while it avowedly amounted to a claim on the part of the Union to dictate to all their fellow-subjects the class of persons they should employ to do private electrical work on private premises." The case is essentially one for the High Court, as, reduced to commonsense, it simply amounts to this, that a body of men constituting a Union are preventing a local governing body from carrying out their legal obligations. It would be interesting to hear what the High Court has to say about this.

Fire Risks.

The electrical papers are again constantly being annoyed by the insistence of the reporters in the Daily Press attributing fires to fusions of electric wires. Apparently, even when it is well known that this was the cause, electrical men consider that electricity is being unduly maligned by calling attention to the fact. A few years ago there were signs of a serious attempt having been made to induce the Public Press to omit references to electricity originating fires; but latterly there has been a revival of the allegation. Of course, fires are caused by electricity, and often in an insidious manner. But a feature of many fires in these times is that it is impossible to trace the cause after the event. Many fires, the cause of which is "unknown," are in buildings that are wired for electric lighting; and though fusion may be the cause, it would, of course, be unfair to attribute the fires to electrical origin without definite information. But the trouble is to get the "definite information" when the fire itself has destroyed all track of the origin. Electricity is therefore in such cases strongly suspect, even if the charge cannot be proved beyond a shadow of doubt. The question of the active part of electricity in fire-raising has frequently been brought to the front in America, as well as in this country. Statistics issued by the National Board of Fire Underwriters of America appeared (according to "Electrical Industries") to show that electricity is the greatest of all fire risks. As the annual fire loss in America is abnormally high, electricity is thus presented in a very unfavourable light. Naturally, the electrical people have sought to counteract the impression which the statistics may have upon the public mind. An investigation was made by the American Society for Electrical Development. In this inquiry the facts concerning fires during 1919 were explored. The result is said to be that in 345 cities 138,553 fires occurred during the year; and it is declared that of these only 3568 "appeared" to be of electrical origin—giving a mean ratio of 2·57 p.ct., as against the ratio of 6 p.ct. to be inferred from the Fire Underwriters' reports. The conclusion reached in the report by the Society for Electrical Development is as follows: "Unquestionably the use of electricity where the circuits are subjected to excessive demands, where the wiring has been improperly done, or where appliances are defective or improperly constructed, constitutes a fire hazard. Ignorance and carelessness on the part of consumers also create a hazard. This is appreciated by the whole electrical industry—in value of product and capital invested, now by far the greatest industry in the United States; and efforts without any abatement are being made to reduce these hazards to a minimum. For this reason the inferences which have been drawn quite erroneously from such reports as those of the National Board of Fire Underwriters are not fair either to the electrical industry or to the public, to whom an exposition of the facts concerning fires of electrical origin is due." Probably our electrical friends will not be prepared to deny that the Cardiff fire noticed on p. 141 of the "JOURNAL" for April 20 was due to an electrical cause. If, in this instance, electricity was at the bottom of the disaster, then why not in many more? There are, of course, numerous cases of highly destructive fires that it is well known have originated electrically. It is the height of folly for our electrical friends to assume a want of knowledge and innocence in this respect.

New Water-Gas Plant at Astoria.

Early last year, the Astoria Light, Heat, and Power Company gave out a contract to the Bartlett-Hayward Company, of Baltimore, for the construction of a 30 million c.ft. per day water-gas plant, which was ready for making gas early in December. The installation comprises a house with twelve sets of water-gas generators, complete fuel and ash handling systems, six salt water condensers, a 1 million c.ft. relief holder, two tar separating tanks, one tar emulsion tank, four engine-driven exhausters, a tar-extractor house, with six tar-extractors, eight scrubbers, twelve purifier boxes, six station meters, a complete system of overhead and underground gas-mains, pumps for fresh water, salt water, tar, oil, steam, &c., and a new boiler plant. Fuel is delivered to the plant at the rate of 150 tons per hour by a belt conveying system from railroad track hoppers. At a central tower, the fines are screened, crushed, and delivered to the boiler plant. The generator-house fuel is eventually delivered to a belt conveyor, which runs the length of the house, and from which the fuel is discharged into circular overhead conical bottom bins having a total storage capacity of thirty hours. One bin is provided for each water-gas set, and is located directly above each generator, which is fed by one of the four hoppers running on an overhead track. An air-blast is furnished to each set at the rate of 22,000 c.ft. per minute, at 44 in. water pressure. All valves are operated hydraulically; and each set is worked from an individual control station of special design, equipped with an interlocking system. The working of all valves on one set can be seen by the operator; and the maximum output of the set is assured by the minimum amount of time required for the operation of the valves at each change of the cycle of operations.

A 1300 H.P. Galloway gas-driven blowing engine at the Scunthorpe works of Messrs. J. Lysaght, Ltd., is fully described and illustrated in last week's issue of the "Engineer." The blast-furnace gas used is cleaned by the wet process, with a final cleaning through a Theissen washer.

NEW CARBONIZING AND COAL AND COKE HANDLING PLANT AT BRIGHTON.

A LARGE MODERNIZING SCHEME.

Brighton will never lose its popularity. There is only one Brighton; and its geographical position in relation to London, combined with its reputation for salubrity, and its associations, will cause it to continue its place in the affections of people in the future as it has done in the past. The residential population of the town has grown; and the number of its visitors every year shows no signs of decline. Enlargement continues to be the rule. In such circumstances, the Brighton and Hove General Gas Company cannot help increasing its gas business; but, like all other concerns, it has had to bear the inflictions and retardments of wartime and since, which have not allowed business progress to be reflected in full measure in the financial outcome. However, advancing demand for the primary product has necessitated extensions and reconstructions, and the opportunity has been taken by Mr. C. H. Rutter, M.Inst.C.E., the Engineer and General Manager of the Company, to incorporate new processes into the works at Portslade. A few days ago an opportunity offered for making, in company with Mr. Rutter, a detailed inspection of the new plant.

Prior to the New Extensions.

Before describing what has been done, let us just glance at the position of the Company's producing capacity prior to the outbreak of hostilities. The large manufacturing station is situated three miles to the west of the town on the eastern arm of Shoreham Harbour. With the development of the works, the names of Mr. John Birch Paddon, Mr. Joseph Cash, and Mr. Rutter (a grandson of Mr. J. O. N. Rutter) are associated. The works were originally established on the site in the year 1870, when the No. 1 section was built. In 1880, No. 2 section was erected, on similar lines to No. 1; and No. 3 section followed in 1890-92. The carburetted water-gas plant (No. 4 section) was originally erected in 1895, and extended in subsequent years. In 1900, No. 1 retort-house was thrown out of use, as the plant was then becoming obsolete; and Nos. 2 and 3 retort-houses were fitted

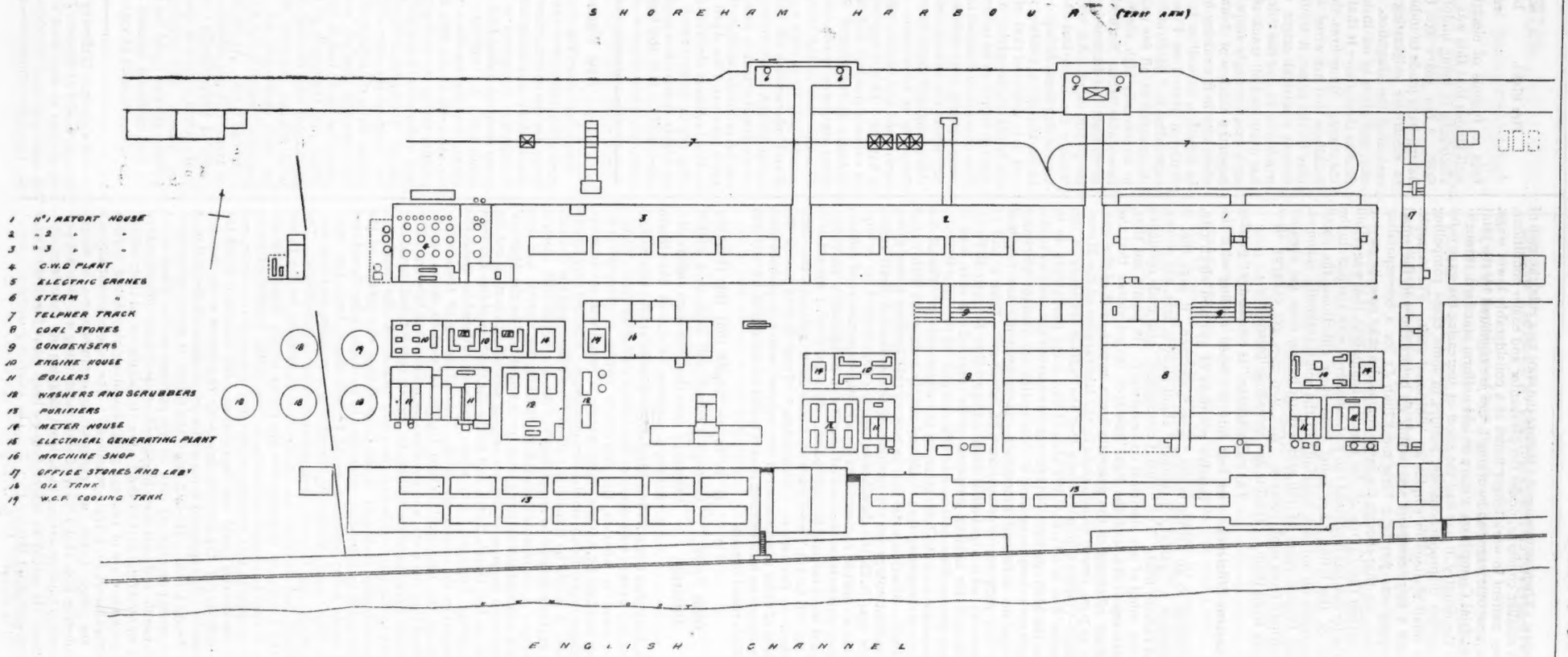


FIG. 1.—GENERAL PLAN OF THE PORTSLADE WORKS OF THE BRIGHTON AND HOVE GAS COMPANY.

with hydraulic stoking machinery, coke-conveyors, &c. Just previously to the war, the total capacity of the works was:

No. 2 retort-house	2	million c.ft. per day.
No. 3 "	2½	" "
C.W.G. plant	3	" "
Total	7½	million c.ft. per day.

It was at the time apparent that extensions would have to be undertaken, as the maximum daily delivery had then increased to 6⅓ million c.ft.; and the total capacity of the plant allowed only a bare margin for this figure. The outbreak of war, however, put an end to any possibility of erecting additional plant, as the Ministry of Munitions would not (as readers are only too well aware) release any of the necessary materials, although strenuous efforts were made in 1917 to put up an additional water-gas set. Upon the signing of the armistice, and the release of material early in 1919, the Company were enabled to put in hand the long-delayed extensions; and the reconstruction of the carbonizing plant and the erection of an additional water-gas set have been occupying the attention of the Company's engineering staff during the past two years.

Growth of Maximum Demand, and Present Output Capacity.

How imperative were the extensions and changes that have been made is seen by the fact that since 1914, the daily maximum delivery of gas has increased to 7¾ million c.ft.—a quarter of a million in excess of the maximum producing capacity of the works when war broke out. It is obvious from this that the war only just ended in time to save the Company from being deficient of output to meet the growth of maximum demand. They are, however, well secured now. The present capacity of the works is as follows:

No. 1 retort-house	4·2	million c.ft. per day.
No. 2 "	2	" "
No. 3 "	..	" "
C.W.G. Plant (No. 4 section)	5	" "
	11·2	million c.ft. per day.

All the carbonizing is now concentrated in No. 1 retort-house—No. 2 house being retained only for working during the peak loads in winter. The plant in No. 3 house is remaining idle for the present. There are two points to be noted about this. In the first place, it will be observed by comparison with the figures as to pre-war capacity that the scheme of modernizing which Mr. Rutter has carried out has caused No. 1 house to have a producing capacity equal within 300,000 c.ft. of Nos. 2 and 3 retort-houses, which are of equal size in respect of area. This illustrates well the progress that has been made in carbonizing practices. The other point is that the carburetted water-gas plant is only credited with a capacity of 5 million c.ft.; whereas the actual capacity is 7 million c.ft. But as a set is generally standing for repair or other attention and as a stand-by, Mr. Rutter prefers to take credit only for the net output. The relative positions of the plant will be seen by the general plan of the works (Fig. 1).

The New Plant in No. 1 House.

Now for the details of the new plant that were obtained during its inspection. Attention first turned to No. 1 retort-house, the reconstruction of which started early in 1919. The choice fell on large horizontals—the size finally selected being 24 in. by 16 in. ⊓ retorts 23 ft. long; or 3 ft. more than the orthodox length. These retorts are capable when fully charged of holding 19 cwt. of coal for twelve-hour carbonization. The settings are in tens in five tiers; and the house contains twenty settings, which give a total carbonizing capacity of 380 tons per day. Gibbons charging and discharging machines (in duplicate) are used; and they are especially powerful in view of the length of the retorts. With five-tier settings, too, the machines have a broad base, so as to prevent any tendency to tip when charging or discharging the top retorts. On the charger there is a 28-H.P. motor (15¼-H.P. is about the usual), so as to ensure a good margin of power. By the way, the chief power used on the works is electricity; and the Company have their own generating plant (of which more presently).

It was noticed that the furnaces are fitted with stepped grates. The settings are worked at about 2350° Fahr. in the combustion chambers. Inspection of the retorts showed that the heats were irreproachable; and the main flue was quite black. There are four chimneys—one to each block of five settings; and in the basement it was seen that there are four of Drakes' draught controllers, which open and close according to the draught in the chimney; and they maintain a perfectly steady draw on the settings. The controllers work on the venetian blind plan, and are beautifully balanced; being fitted with slide weights so that they can be balanced to a nicety.

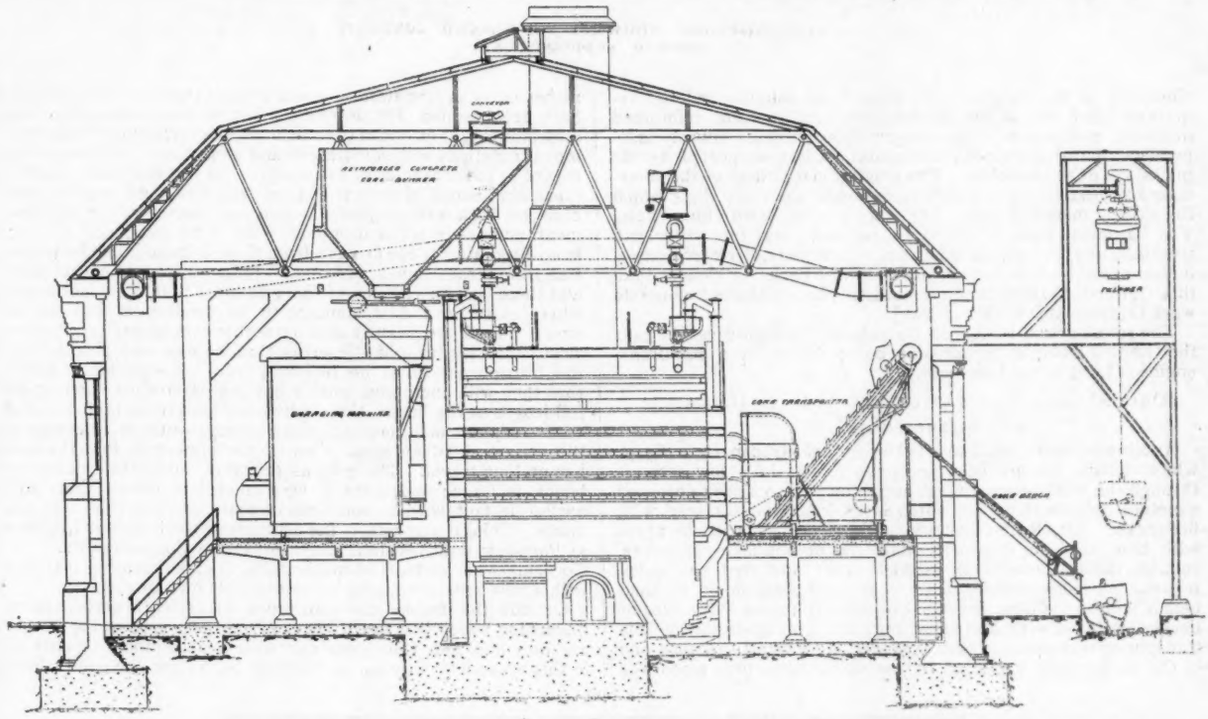


FIG. 2.—CROSS SECTION OF THE RETORT-HOUSE, SHOWING THE SPECIAL FEATURE OF COKE TRANSPORTER ARRANGEMENT AND INCLINED QUENCHING-BENCH.

Although not quite following the plan of inspection, we will finish the notes made in regard to the settings. It was observed that every part of the benches is accessible by stairways and gangways going right along the top of the settings; so there is no excuse for any negligence to pipes, governors, and so forth. Speaking of governors, it was observed that there are two on each block of five settings, and separate hydraulics, with take-off pipes from each hydraulic, so that they can be worked separately. Thus everything has been done in respect of detail to ensure convenience and uniformly good working.

Fig. 2 is a section of the retort-house; and it shows the general arrangement of the plant and machinery. A photograph also gives a general view of the retort benches (fig. 3). The contractors for the carbonizing plant, including all retort ironwork and foul mains, were Drakes, Ltd.; while, as already indicated, the charging and discharging machines are by Gibbons Bros., Ltd.

Concrete Stage-Floor and Coal-Bunkers.

There is a feature of the house which calls for special notice. It is that the stage-floor and the overhead coal-bunkers are on the Indented Bar Company's system, and built by the Broadway Construction Company—the two being allied firms. We believe this is the most extensive stage-floor so far constructed on this system; and some idea as to its area will be gained by mentioning that the house itself is 285 ft. long by 80 ft. wide, of which the retort-bench occupies an area of 230 ft. by 23 ft. The solid

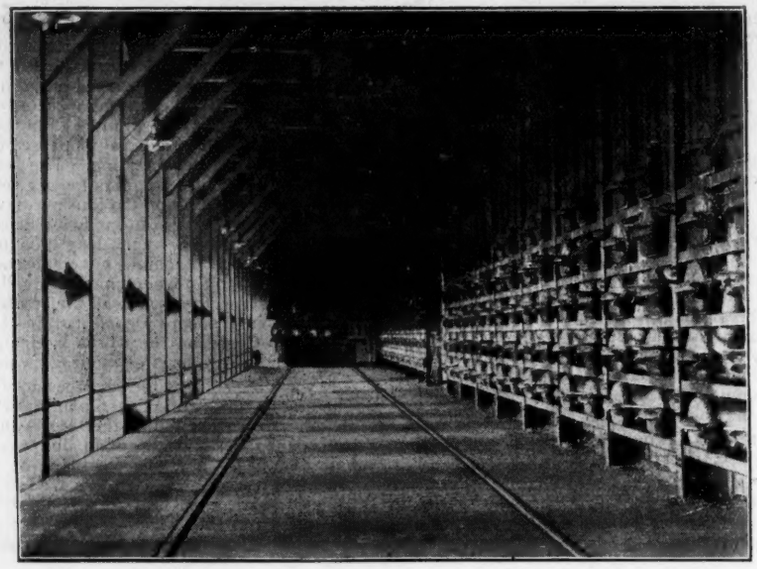


FIG. 3.—CHARGING-FLOOR, SHOWING REINFORCED CONCRETE COAL-HOPPER SUPPORTS, &c.

character of the floor and its supporting columns will be remarked from one of the photographs (fig. 4). The reinforced overhead coal-bunkers are supported on columns entirely independent of the stage, with horizontal girders supported by the buckstays of the benches. The longitudinal girders of the stage-floor are situated immediately underneath the rails along which the stoking machine runs. The stage is covered with blue bricks. The basement floor is also brick covered; and the writer can truthfully say, though he has been in numbers of retort-houses, he has never been in the basement of one cooler or cleaner than this. [Further information regarding the reinforced concrete work is given later in this article.]

The retort-house is lighted throughout by high-pressure gas; the Keith-Blackman compressor being driven by a small gas-engine housed in the basement.

Drakes' Coke Transporter, and a Clean House and Atmosphere.

Another feature of the house is Drakes' coke transporters (fig. 5), which deliver the hot coke from the retorts in a few seconds through the windowways of the house, on to an outside reinforced concrete quenching-bench, which is inclined, and surfaced with firebricks. Mr. Rutter believes, and we are disposed to agree with him, that the days are numbered of hot-coke conveyors, running the full length of retort-houses; and that the quick transfer of coke outside, there to be quenched on an inclined bench, will be the most prevalent practice in future in the case of houses equipped with horizontal retorts. The operation of this transporter was watched with considerable interest, because one of the earlier ones inspected by the writer some time since was rather noisy in operation. It was evident that curative remedies have been applied; for, despite the heavy charges from the large retorts at Brighton, one of the machines was performing its coke removal functions with smoothness and a minimum of noise, having regard to the character of the work. The transfer from retort to quenching-bench of several charges was witnessed; and in every case the work was completed within sixty seconds. In the basement, no coke or water droppings were to be seen; and so there is no discomfort to the firemen from these causes. The house was free from steam, fumes, and dust. Tidiness reigned everywhere; and there was an absence of the griminess that is so noticeable where steam and dust combine in its production and persistence. These are healthy and agreeable conditions in which to work. Mr. Rutter told the writer that he was very pleased with the transporters; and he believes, from his experience so far, that they will, compared with a hot-coke conveyor running the full length of the house, show a tremendous saving, taking overall costs—capital, maintenance, and running—without reference to the collateral advantages. One of the benefits is that the coke has no long travel. The coke as delivered on to the quenching-bench is large; and there is very much less breeze than ordinarily—in fact, with a good class of coal, not more than 5 p.ct. is made. This, at any rate, is the estimate of the Resident Engineer at Portslade and Assistant Engineer to the Company (Mr. H. V. Corfield), who, we learned incidentally, is experimenting just now with a new breeze-washing machine of his own devising.

Outside the house, the reinforced concrete, firebrick faced quenching-bench was seen. It runs the full length of the house; and one man does the quenching with a hose-pipe. Quenching in this systematic way on an inclined bench has the good effects

FIG. 4.—UNDER THE DISCHARGING FLOOR, SHOWING REINFORCED CONCRETE FLOOR-SUPPORTS—TAKEN DURING ERECTION.

of allowing the coke to drain and so helping to relieve it of moisture, and there is no extravagance with water. The water drops down, and runs away to an underground tank (situated at the end of the quenching-bench), and is used over and over again, and so less water is required for quenching than would be the case by doing the work in the usual way. A series of weirs has been provided in the tank, so that any grit there may be in the water is caught, and settles-out before the water is pumped again for re-use. The pump for the water supply is a centrifugal one, direct-coupled to an electric-motor. This method of coke treatment is more or less in the experimental stage, and improvement comes from experience. One thing which has been learned at Brighton is that, the bench being inclined, a dwarf iron fence along the front of it prevents coke slipping off, and causing a mess in the yard and labour in picking it up again.

Coal-Handling Plant.

Attention was next directed to the scheme adopted, in connection with the reconstruction of No. 1 retort-house, for modernizing the work of coal-handling. Fig. 6 shows a sectional elevation of the coal gantry, conveyors, coal-crushers, and elevators. The coal comes by sea to Shoreham Harbour. The writer walked along the gantry (which with the head on which the cranes stand must be some 150 ft. in length) to witness the course of the coal from the hold of the steamer to the hoppers above the new benches, or into store.

The steamer discharge is effected by two fine 3-ton electric cranes by Stothert and Pitt. These stand on an elevated platform at the head of the gantry (fig. 7), and each of them lifts 1-ton capacity grabs, which discharge into a 60-ton storage hopper for delivering the coal on to a rubber surfaced cotton conveying band, travelling (under a corrugated iron roof) the whole length of the gantry. All the coal received is dealt with from this point, except when an excess of cargoes arrive, and then these have to be removed by the old steam-cranes. Eventually, it is proposed to utilize at this point of coal reception Avery's totalizing weighers, to weigh-in all the coal. The band conveyor has a capacity of 90 tons per hour; and this, like all the rest of the plant in this new installation, is electrically operated. The band conveyor (which is about 130 ft. long) has been running now for some six months, and over it have passed many thousand tons of Durham coal. Notwithstanding, it was seen to be in excellent condition. In fact, it is practically impossible to trace any wear of the rubber as an effect of the conveyance of the coal. At the inward end of the conveyor it discharges through a shoot into hoppers, which feed two 45-ton per hour coal-crushers, from which the coal drops into the boots of two bucket elevators.

All the coal-conveying plant above this level is accessible by stairways and platforms, so that an examination is quite an easy and comfortable matter. The bucket elevators raise the coal to a 90-ton per hour band conveyor running the whole length of the retort-house (about 250 ft.), and discharging into the overhead reinforced concrete bunkers which were mentioned in the early part of this descriptive article. The capacity of these bunkers is 630 tons, which is equivalent to at least 36 hours' maximum requirements. The band of this conveyor is also rubber covered. The coal is deposited in the hoppers where required by a system of throw-offs. The whole of the plant is very silent in its working. Should there be any breakdown of the conveyors, the coal can be dealt with from a coal-hopper on the gantry, from which hopper provision is made for feeding into wagons.

Looking into the coal-stores, it was noticed that at the present time coal is being removed from them by skips and travelling steam-cranes feeding wagons which convey the coal into the coal-crushers for elevation into the retort-house.

The whole of the coal-handling plant was supplied by Messrs. Cutler and Sons, Ltd., who also built the steel gantry for the cranes.

The Telpher Coke Plant.

The coke-handling plant (also by Messrs. Cutler & Sons, Ltd.) consists of a telpher track, supported on steel-framed trestles, and running over the coke grounds the whole length of the three retort-houses. This plant has been in use since No. 1 retort-house was started after its reconstruction. The coke is transported in 1-ton telpher skips to any part of the storage ground, or it can be discharged into reinforced concrete storage hoppers, from which carts and sacks can be filled. The skips can also discharge into a jigging screen for grading the coke and removing ashes. The telphers and skips were supplied by Messrs. Strachan and Henshaw.

The coke for the water-gas plant is at the present time supplied from the concrete hoppers into small wagons, which are raised by a hydraulic lift. But a new scheme is now being carried out. Concrete hoppers have already been constructed for this purpose; and new coke-transporting plant is being erected for running coke up an inclined plane into overhead coke-bunkers for automatic and continuous feeding into the water-gas generators. This will completely obviate all the wagoning from the present hoppers.

The Electricity Plant.

As already indicated, all the new machinery is electrically driven; and it was necessary to put down an entirely new generating plant. There was not enough room to place this close to No. 1 retort-house, and so it has been located at the other end of the works, where the engine-house of No. 3 section was available for the purpose. It makes a really fine generating house. Steam was also available at that point. The plant consists of Browett-Lindley vertical compound steam-engines of 365 H.P. each, in duplicate, driving 250-KW. dynamos, supplied by the General Electric Company, who also provided the switchboards, and all the wiring on the works. In the generating-house, the distributing switchboard is mounted on a little gallery; and the current, of 220 volts, is taken right away to the switchboard in No. 1 retort-house for distribution where and as required. It is all under perfect control.

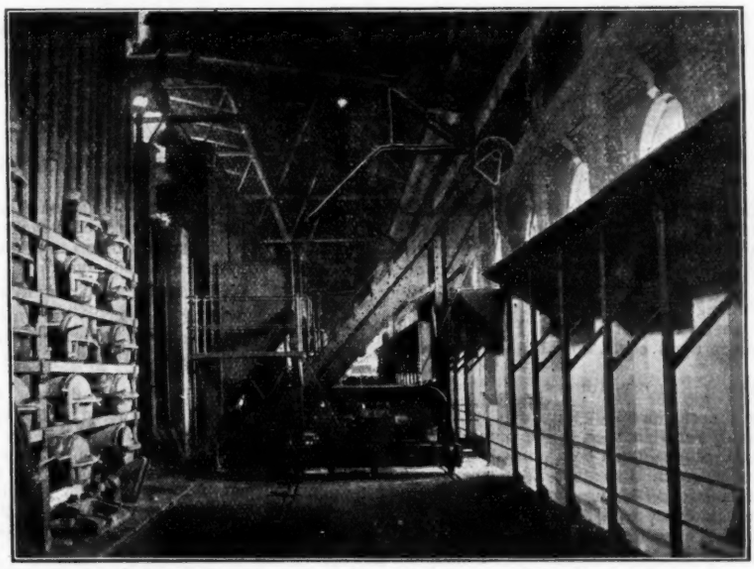


FIG. 5.—DRAKES' COKE TRANSPORTER.

Cost per Mouthpiece and per Ton.

The scheme so far described may be taken as a section by

Description of Plant.	Cost per Mouthpiece.	Cost per Ton of Coal Carbonized.
Carbonizing Plant and Foul Mains—Ten settings of tens, 24 in. by 16 in. by 23 ft. (400 mouthpieces), to carbonize 380 tons of coal per day, and produce 4,200,000 c.ft. of gas	£190	£200
Stoking Machinery—Chargers	13¼	14¼
Coal-Bunkers	17¾	18¾
Coal-Handling Plant, including cranes, conveyors, crushers, elevators, and gantry.	80	84
Coke Plant, consisting of Drakes' coke-transporters, quenching-bench, telpher track, and telphers	57	60
Electric Generating Plant and Wiring	21	22¼
	£379¼	£399¾

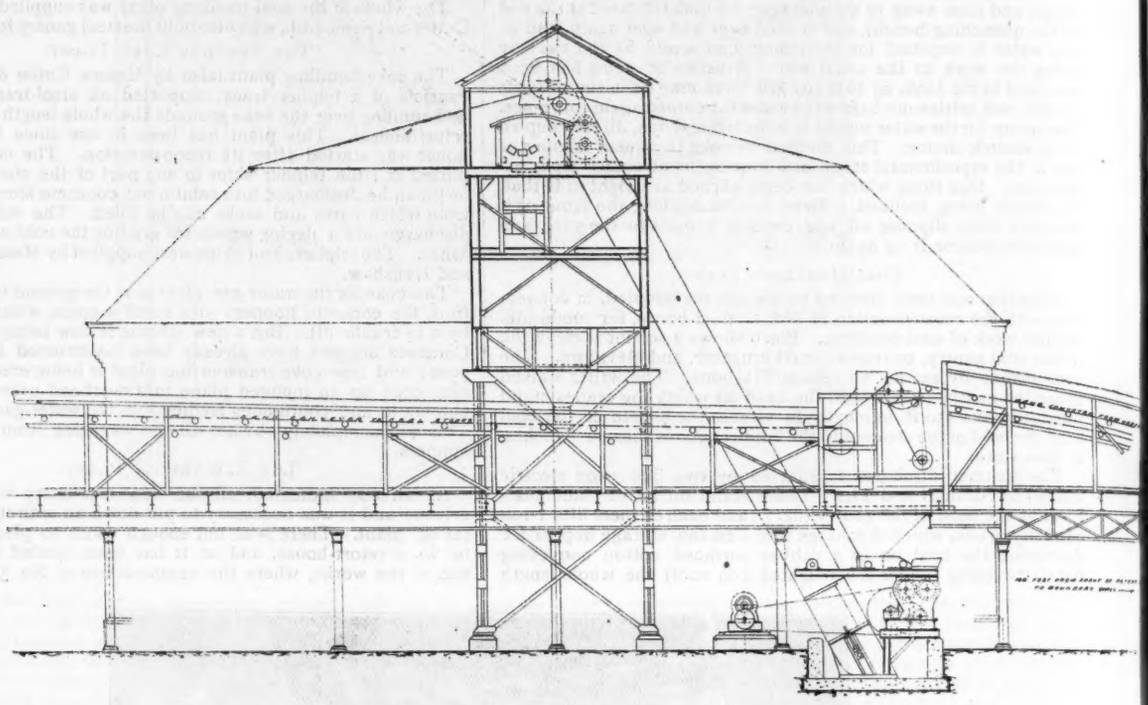


FIG. 6.—SHOWING COAL-HANDLING PLANT FROM TH HARBOUR

itself, without any reference to the carburetted water-gas plant, which has yet to be described. Mr. Rutter has very kindly got out at our request, and for incorporation in this article, the figures showing the costs of the plant per mouthpiece and per ton of coal carbonized. The figures are tabulated [p. 319] ; and upon them—particularly having regard to the costs of labour and materials to-day—there can be congratulation. They show the influence of modern practices upon costs, despite their height in these days.

Nos. 2 and 3 Retort-Houses.

On the way to inspect the carburetted water-gas plant, we walked through Nos. 2 and 3 retort-houses. The plant in each house consists of four small blocks, each containing six settings of eight 16-in. round retorts, 20 ft. through. They are direct-fired; and, as previously explained, are used only for the peak loads in the winter. Although direct-fired, they have given a good account of themselves both in respect of production and fuel expenditure. The charging is by Arrol-Foulis hydraulic charging-machines, with a Holmes coke-pusher in No. 2 house, and an Arrol-Foulis pusher in No. 3 house. In No. 2 house, it was observed that some of the retorts are being renewed, to help to meet the peak load next winter. The coke-handling machinery in both instances consists of hot-coke conveyors running the whole length of the house, and discharging on to cross conveyors for transport to storage hoppers in the coke-yard.

Reinforced Concrete Work.

Before proceeding to describe the water-gas plant, as promised earlier in this article, some further details may be given of the reinforced concrete work erected by the Broadway Construction Company.

As already stated, the stage flooring and the coal-bunkers in the retort-house are constructed on this system. In such a warm situation, it was necessary to take every precaution for the adequate expansion of the structures, or rather it should be said that provision had to be made for the expansion of the retort-benches independently of the floor and the hoppers. In the case of the floor, a space of 3 in. is left in all directions between the retort-benches and the concrete. On the charging side, the floor is carried on columns spaced 11 ft. 6 in. apart longitudinally and 11 ft. transversely of the house, immediately under the longitudinal girders carrying the machinery rails. The rest of the floor is built on the cantilever principle overhanging 6 ft. or 7 ft. out-

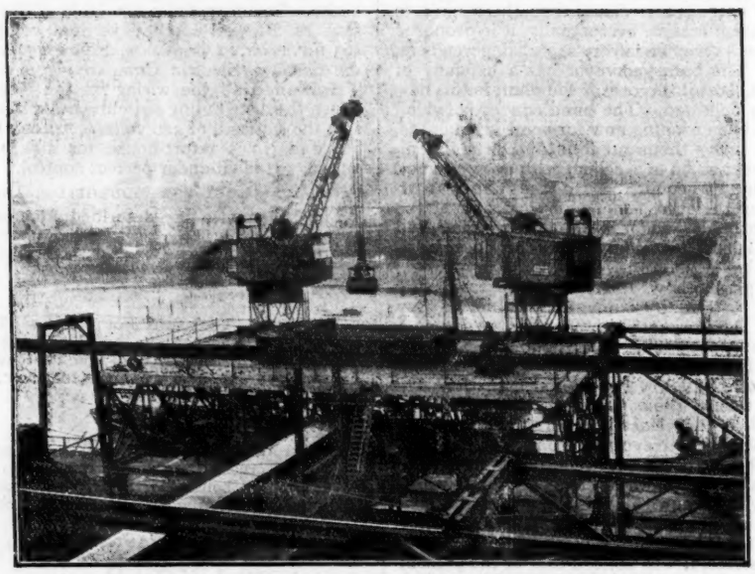
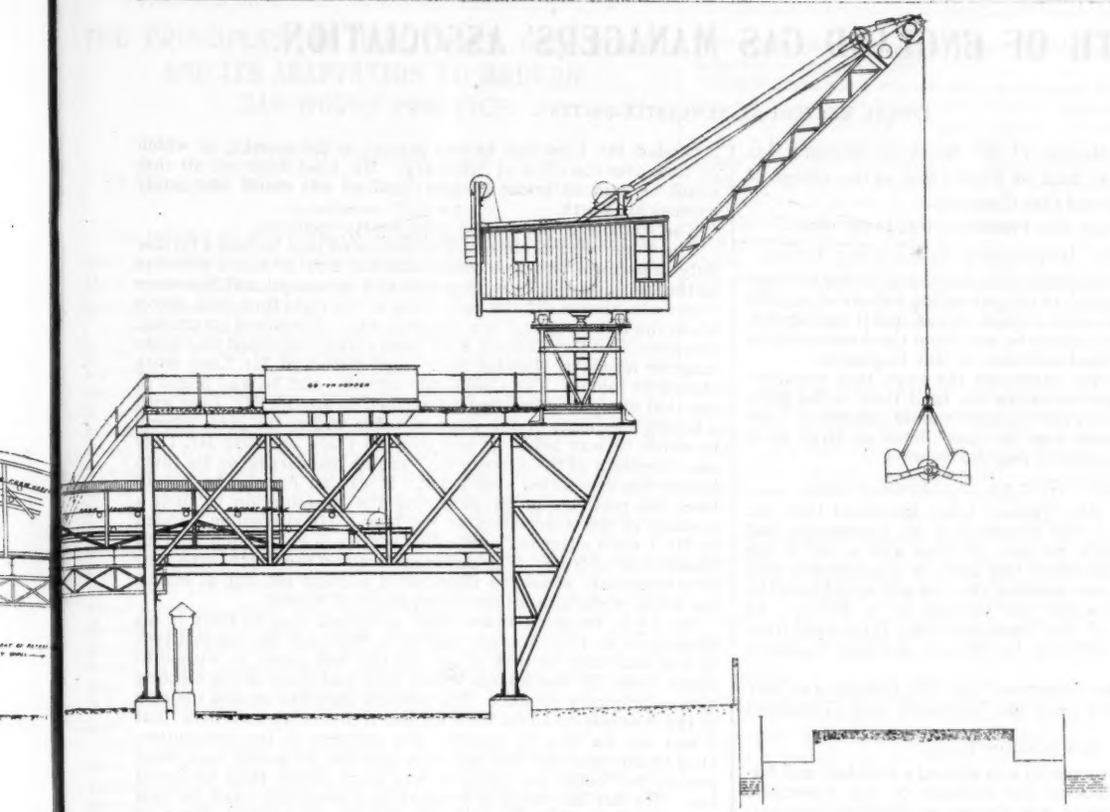


FIG. 7.—COAL DISCHARGING GANTRY, SHOWING THREE-TON ELECTRIC CRANES AND RECEIVING HOPPER.



HARBOUR END OF GANTRY TO THE RETORT-HOUSE ELEVATOR.

side the columns. The girders are not attached in any way to the structure of the house; but at the ends they are supported on cast-iron plates let in to the walls, allowing perfect freedom to move in any direction.

On the discharging side, the floor is similarly supported on columns, but only the outer edge is built on the cantilever principle. On the inner side near the retort-benches, the beams are carried on brackets attached to the buckstaves. Here also, the beams can move in any direction so as to avoid any danger of cracking or rupture.

With the coal-bunkers, similar allowance was made for overcoming any danger of distortion from expansion of the retort-benches. As already mentioned, one end of the beams supporting the hoppers is carried on the top of the buckstaves; and provision is here made by means of curved cast-iron plates for the free movement of the buckstave underneath the beam without interfering with the latter. The design of the coal-bunkers was particularly complicated on account of the necessity for erecting them between the roof principals, the pitch of which did not correspond with any multiple of that of the buckstaves. Consequently, some of the bunkers are supported on two columns and beams, and some on three. This involved preparing a different set of stress diagrams for each bunker, and the provision of struts and ribs for equalizing the strains. The designs of the Indented Bar Company have satisfactorily overcome all the difficulties; and it may be mentioned, for the information of engineers contemplating this kind of reinforced concrete work, that a detailed description of all the reinforced concrete work executed for the Brighton Gas Company is appearing in the current number of the "Indented Bar Bulletin." The design of the coke-bunkers is on the stereotyped lines; and a detailed description of these is hardly necessary.

Carburetted Water-Gas Plant—Automatic Operation.

The carburetted water-gas plant is situated at the end of No. 3 retort-house. Until 1919, the plant consisted of four Humphreys and Glasgow carburetted water-gas sets—two of them being equal to 1¼ million cubic feet per day, the other two to 1 million cubic feet per day. During 1919, a new 2 million set was erected, and brought into use early in 1920. During the latter year, two of the old sets were reconstructed, and brought up to 1¼ million cubic feet capacity. The 2 million set has hydraulic valves for controlling the operations, and, in addition, an automatic electrically driven control, which eliminates all hand labour in this connection. This is very interesting; and it makes water-gas manufacture quite an automatic operation. The electrical apparatus is operated by a 1-H.P. electric motor which revolves very slowly a shaft which operates a series of cams. As the cams come round, they actuate the hydraulic valves which operate the stack-valve, blast-valve, &c. It is very ingenious; and, as Mr. Rutter conversationally put it, "it looks almost uncanny to see the valves open and close without human interference." There is an indicator which shows whether each valve is open or shut. Then, as already explained in dealing with the telpher plant, the old method of coke transfer and feeding is to be abandoned, and is to be replaced by an automatic and continuous feed into the generators. The complete mechanical operation will enhance economy.

Descending from the operating-floor, a glance was taken into the turbo-blower house, where are also assembled all the pumps for the water-gas plant.

The Boiler-Plant.

In conjunction with the new developments, there has been considerable extension to the boiler plant, particularly in Nos. 3 and 4 sections. During the last three years, four Lancashire boilers, three of them 30 ft. by 8 ft., and one 30 ft. by 7 ft. 6 in. have been installed. The additions, with the other older Lancashire boilers, now make a complete range of eight boilers of this type, all working at 110 lbs. per square inch. and stoked on coke breeze, burned with forced draught supplied by Sturtevant fans. The boilers in Nos. 3 and 4 sections are used for the supply of steam to the water-gas plant, the electricity generating engines the hydraulic compressors, exhausters, and pumps. Nos. 1 and 2 sections of the works are provided with independent steam plant for driving the exhausters and pumps.

Final Observations.

As will have been seen, up to this point much new work of considerable interest had been inspected. As the writer left the main objects of his visit, the splendid purifier house was passed which was one of the final pieces of engineering work of Mr. Joseph Cash before resigning official duties and joining the Board of the Company. A glance round the repairing-shops, which are thoroughly well equipped with machine and other tools, showed that, the works being so far from the town, it is necessary to be prepared for all emergencies in the way of breakdowns. The Company have also several motor machines—steam and petrol—so that there is ample work to keep the shops busy. A peep into the smithy, and there three forges were seen, in connection with which a Sturtevant fan is used for blowing the fires, and an exhaust-fan for getting rid of the steam.

And here is the recreation ground, close to the various shops and offices, right on the seashore, with the waters of the English Channel almost lapping the groin which the Company have built for the protection of their property. Fortunate are the workers of the Brighton and Hove Gas Company, compared with their fellows working day after day in densely populated industrial centres.

The writer has to thank Mr. Rutter for the details of the work upon which he has been so busy since the armistice, and with which he so freely supplied him on the occasion of the visit. Also for the drawings and photographs, which greatly enhance the interest of the descriptive matter.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

ANNUAL MEETING AT NEWCASTLE-ON-TYNE.

The Annual General Meeting of the North of England Gas Managers' Association was held on Friday last, at the offices of the Newcastle and Gateshead Gas Company.

Mr. Arnold W. Branson (the President) was in the chair.

Donation to the Gas Institution Benevolent Fund.

The President, after expressing his pleasure at seeing so large an attendance, having regard to the prevailing industrial trouble and the curtailment of the train service, moved, and it was agreed, that a contribution of ten guineas be sent from the Association to the Benevolent Fund of the Institution of Gas Engineers.

Mr. H. E. Bloor (York) expressed the hope that members would contribute more generously to the fund than in the past. He was of opinion that every gas engineer should subscribe. The fund could have an income two or three times as large as at present, and still find an effective field for its work.

A Past-President's Gift to the Association.

The Hon. Secretary (Mr. Herbert Lees) intimated that Mr. E. F. Hooper, of Stroud, a Past-President of the Association, had expressed a desire to mark his year of office with a gift to the Association. A small Committee had been in consultation with Mr. Hooper; and it had been decided that the gift would take the form of fifty guineas towards the nucleus of a library. In addition, the Directors of the Newcastle and Gateshead Gas Company had promised to house the library, and give members facilities for using it.

The form of the gift was approved, and Mr. Hooper was very cordially thanked, as also were the Newcastle and Gateshead Gas Company.

The Membership Roll.

Dr. W. B. Davidson (Newcastle) was elected a member, and Mr. W. Batt, assistant distribution gas engineer of the Newcastle and Gateshead Gas Company, was elected an associate member.

Amendment of Rules.

Rule 10 of the Association was amended to read:

> The Association shall hold general meetings in May (which shall be the annual general meeting) and in October each year.

Rule 3 of the Special Purposes Section was amended to read:

> The management of the section shall be entrusted to a Committee of its members, consisting of a Chairman, Vice-Chairman, Secretary, and Treasurer, five members to be elected annually, and the President of the Association for the time being, providing he is the representative of an undertaking in membership.

Papers Read.

Mr. C. H. Chester, F.C.S., read a paper on "The Principles of the Tully Gas Plant and its Adaptation to Modern Gas-Works Practice."

Mr. Frank H. Robinson, Assoc.M.Inst.C.E., read a paper on "Experiments in Complete Gasification at Harrogate."

The papers, together with a report of the discussion thereon (taken simultaneously), will be found on pp. 323-29.

Office Bearers.

The following are the office bearers for the ensuing year

President: Mr. F. C. Willis, of North Shields.
Vice-President: Mr. J. E. Blundell, of Carlisle.
Committee: Messrs. J. D. Currie, S. Shadbolt, and Mr. C. F. Blincoe.
Hon. Secretary and Treasurer: Mr. Norman S. Cox, of Sunderland.
Hon. Auditor: Mr. C. H. Armstrong, of Wallsend.

A Tribute and Presentation to Mr. Herbert Lees.

At the conclusion of the ordinary business, two interesting ceremonies took place in honour of Mr. Herbert Lees, of Hexham, who has acted as Hon. Secretary and Treasurer of the Association for close upon twenty years, and had signified his intention of resigning the offices.

The President referred to the great loss the Association would sustain by losing the services of Mr. Lees as Hon. Secretary and Treasurer. Their Hon. Secretary felt that the time had come when he should be relieved of the office. When they remembered the work he had done, they could not but agree, however reluctantly, that Mr. Lees had earned a rest. They were glad to see that it was not on account of ill-health that he was resigning, nor was it due to advancing years. Personally, he could see no bright side to Mr. Lees' retirement, excepting that it had given them an opportunity of showing him in some tangible way how much they appreciated his services, and how greatly they esteemed him as a friend. It was felt that a vote of thanks would hardly meet such an occasion. Therefore the Committee had decided to ask the general meeting to make Mr. Lees an honorary member of the Association—the Association's first honorary member. (Applause.) He thereupon formally proposed that Mr. Lees become the first Honorary Member of the Association.

Mr. A. B. Walker (Wallsend), in seconding the resolution, reminded Mr. Lees that he was present at the meeting at which he took over the office of Secretary. Mr. Lees deserved all that could be said in praise of him; and no one could adequately express his worth.

The resolution was carried amid hearty applause.

The President again rose and intimated that he had a further duty to perform, and one which afforded him as much pleasure as the last. In Mr. Lees they had had an exceptional Secretary—one who always did the right thing at the right time, and, above all, in the right way and in a pleasing way. It was not surprising, therefore, that there should have been a wish expressed that some tangible means of showing their appreciation of Mr. Lees' work should be found. The Committee agreed; and he was proud to say that every member had subscribed to provide Mr. Lees with a lasting memento of his years of office and of the great esteem in which he was held. It was over 26 years ago that Mr. Lees was President of the Association; and he had carried on for them in one way or another ever since. It was an honour, he felt, to have the privilege of handing over the presentation to such a member of the Association as Mr. Lees. He thereupon handed to Mr. Lees a silver tea and coffee service, a gold watch, and an illuminated address. The coffee service and the watch were suitably inscribed; while the illuminated address set out at length the terms of the subscribers' expressions of esteem.

Mr. Lees returned thanks and confessed that to reply to his election as an Hon. Member and to the gifts was the hardest task he had had since he took office. In the first place, he wished to thank them for the honour which they had done him in electing him an honorary member. He believed they had broken the rule of the Association so far as it applied to honorary members; but it was not for him to question the decision of the Committee. Had he not been the first honorary member he would have been proud; but being the first, he was more proud than he could say. He felt like being a freeman of a great city—and the first freeman, too. Mr. Lees then went on to recount some of his experiences as Secretary, and mentioned the changes which had taken place in the membership of the Association, and how it had grown in importance. In a defence of the older members of the gas industry, the pioneers of the Association, Mr. Lees said he had heard some people refer to them in a way which suggested that they were not enterprising. Well, he did not associate himself with such a view, for he knew how enterprising the pioneers in their industry really were. It was these men who had laid the foundations of the gas industry, and with less facilities for doing their work than they had to-day. He felt that they all owed a great debt to the old members of the Association—many of whom had passed away while he had been their Secretary. Mr. Lees closed his remarks by assuring them how much he appreciated their gifts, but even more the spirit which prompted them. It confirmed what he had always felt—that the members were not simply fellow members, but were in a very real sense personal friends of his.

Tea was afterwards served.

Melting-Point of Ammonium Sulphate.

An investigation has been carried out by Messrs. James Kendall and Arthur W. Davidson, of Columbia University, into the melting-point of ammonium sulphate; and their account of what they have done has appeared in the "Journal of Industrial and Engineering Chemistry." In this, they remark that the implicit trust which most chemists place in tables of constants is unfortunately not always justified. Even for the most common chemicals, the current data for such fundamental properties as melting-point and boiling-point are often quite indefinite. For example, the melting-point of potassium iodide is variously given as from 614° to 723°. For the melting-point of ammonium sulphate (a substance which is produced by the ton daily), the figures fluctuate still more widely. The lowest recorded value is 140°, and the highest 423°. This particular case is cited by a recent writer (Janecke) as a striking example of the neglect of physical chemistry in Germany. His own efforts to furnish a solution, however, only serve to confuse the problem still further. To enable the United States to escape the possible reproach that physical chemistry is still more flagrantly neglected in that country, Messrs. Kendall and Davidson briefly discuss the fusion phenomena of ammonium sulphate, and present an explanation of the discrepancies in the literature. It is demonstrated in their article that Janecke's value for the melt-point of acid ammonium sulphate (251°) is more than 100° too high—the correct figure being $146{\cdot}9° \pm 0{\cdot}5°$; while his value for the melting-point of neutral ammonium sulphate (359°) is more than 150° too low, the correct figure being $513° \pm 2°$. The extreme discrepancies recorded in the literature are shown to be due essentially to the instability of the neutral salt when heated in an open tube. "In the light of the results obtained," they conclude, "it would seem that Janecke's plea for more investigations of the physical properties of the common chemicals in everyday use might profitably be amended to a plea for fewer investigations of somewhat greater accuracy."

THE PRINCIPLES OF THE TULLY GAS PLANT AND ITS ADAPTATION TO MODERN GAS-WORKS PRACTICE.

By C. H. CHESTER, F.C.S.

[A Paper read before the North of England Gas Managers' Association, May 6.]

The subject of this paper is as interesting as it is important; quite a number of gas undertakings having adopted the Tully plant as an addition to, and in a few cases as a replacement of, existing gas-making plant.

The plant consists essentially of a retort or retorts (according to the class of coal to be used and size of plant) superimposed on a generator with outlet gas connections, valves, &c. A valve box controls the upward and downward flow of gas generated, or, to state it more precisely, admits steam either at the top of the retort and/or chequer work for down runs, or below the firebars on up runs with a corresponding gas-valve opening simultaneously. The fuel to be used is admitted centrally to the retort in the case of the larger plants, or by means of a side charging door in the case of smaller units. Where possible, however, it is preferable, on account of labour cost, cleanliness, and saving of time, to arrange a central feed from suitable hoppers. A half-ton charge can be admitted in a total "standing off" time of about five minutes by this method, whereas by hand charging it would take about fifteen minutes. In a plant making 30,000 c.ft. per hour, the additional gas made during the extra ten minutes' working amounted to 5000 c.ft. The generator and retort are built-up with bricks on end; special blocks and tiles being inserted where necessary. This type of lining has proved quite suitable and lasting, is easy to repair, and a complete renewal would be at a minimum cost.

Two points which have received due consideration are, however, of great importance in the Tully plant. These are the positions of the waste-gas ports and their relative position to the secondary air inlets, with a view to—(1) obtaining complete combustion of the waste gases, (2) correct distribution and utilization of the heat given off, (3) prevention of short-circuiting of blast and resultant local formation of clinker. With a V step grate and waste-gas ports near the walls of the generator (old type), the blast naturally takes the easiest and shortest course—viz., circumferentially round the charge.

Another point makes it perfectly clear why the blast travels up the walls of the generator. The large pieces of fuel entering the generator proper from the retort have the tendency to fall to the walls of the generator; while the small fuel remains as a central core, with the whole weight of the fuel in the retort resting upon it. The resistance is, therefore, obviously greater in the centre of the charge, and has to be allowed for. The makers have now overcome all these difficulties. The plants are now fitted with flat grates and dead-plates; the waste-gas ports being situate in the lower end of the retort. It is desirable, too, that the air should be travelling in the same direction as the gases from the producer or generator, and so distribute the heat of combustion along the whole length of the retort. The secondary air requires adjustment; and provision for this is made to suit the different classes of fuel to be used and the blast pressure available.

The following are averages of analyses of the waste gases:

Period of Blow.

	First Minute.		Second Minute.
CO_2	16·5	..	17·2
O_2	0·3	..	1·4
CO	1·6	..	0·8

The presence of 1·6 p.ct. CO is accounted for by the accumulation of gas before opening the snift-valve. The figures were taken when the plant was working normally, a condition more easily achieved when it is running continuously.

It is essential, too, that the waste-gas ports should be constructed obliquely and not horizontally to the chequer work; otherwise blockage is likely to occur. The dead-plates referred to are designed to concentrate as nearly as possible the bulk of the heat in the centre of the generator; adhesion of fused clinker to the walls of the generator being thereby avoided to a large extent. This is extremely important from the point of cost of repairing the generator lining, falling-off of make, &c.

The distillation of the coal being used is accomplished in two distinct ways—first, by the heat generated by the combustion of the waste gases, and, secondly, by the passage through the coal charge of the hot water gas with a temperature of approximately 1000°C generated in the producer immediately below the retort. The distillation process may thus be described as coming under the heading of low-temperature carbonization in a protective atmosphere of water gas. The tar and liquor produced are an indication; but I will deal with these later.

The temperature in the retort should be in the neighbourhood of about 450° C. at the top, gradually increasing to 1200° C. at the lower end of the retort immediately above the waste-gas ports; and a yield of rich gas is thus obtained. The descending coal reaching the water-gas section as coke is made incandescent by the air-blast, and subsequent steaming produces water gas. This results in higher efficiency than can be obtained with retorts and separate water-gas plant.

The following is a conservative estimate of how the ordinary gas per ton of coal used is obtained, and is intended to illustrate as nearly as possible how the plant works. It will be readily understood it is impossible to gauge what actually happens; but I have every confidence in putting this theory before you after extensive study of the results obtained. In the process of complete gasification 12,000 c.ft. of 500 B.Th.U. gas is obtained per ton of coal passing through the retort, while a further 48,000 c.ft. is obtained from the same fuel in the form of water gas in the generator. Calculating this 48,000 c.ft. of water gas at 300 B.Th.U., a resultant gas of 340 B.Th.U. gross is obtained, as follows:

Coal gas . .	12,000 c.ft. × 500 =	6,000,000	B.Th.U.
Water gas . .	48,000 c.ft. × 300 =	14,400,000	,,
		20,400,000 =	340 B.Th.U. per c.ft.

The yield per ton varies inversely with the quality of gas obtained per ton, by using up extra coke to heat-up the retort during the blowing operation. In this estimate it will be seen that I have taken the round figure of 60,000 as the yield in cubic feet per ton of coal, although I have obtained results in excess of this where plants are working regularly.

WORKING RESULTS.

The following figures, taken over a week's working at a 70-million works in Scotland, will give an indication of the excellent results obtained in the Tully plant.

The fuel used was Elphingstone mixed nuts over 1½ in. and through 2½ in. The sample was in pieces up to 2½ in., and rather dusty. The majority of the lumps were dull and soft, and easily broken. The sample was submitted to proximate analysis, and an analysis of the ash was made. Besides the ordinary coking test by the crucible method, the sample was also put through a test in the Lessing electric coking furnace for the determination of gas and tar yields and rate of gasification.

The following are the results obtained:

Proximate Analysis.

Original Sample.	Elphingstone Mixed Nuts. P.Ct.
Moisture	12·68
Volatile matter (excluding moisture)	32·42
Fixed carbon	50·92
Ash	3·98
	100·00
Ash-Free Dry Coal.	**P.Ct.**
Volatile matter	38·90
Fixed carbon	61·10
	100·00

Analysis of Ash.

	HCl Soluble Inclusive (Water Soluble).		HCl Insoluble.		Total.
					P.Ct.
Silica	—	..	40·98	..	40·98
Alumina	8·02	..	22·96	..	30·98
Ferric oxide	10·86	..	2·08	..	12·94
Lime	1·72	..	0·66	..	2·38
Undetermined (alkalies, sulphuric anhydride, &c.)	9·74	..	2·98	..	12·72
	30·34	..	69·66	..	100·00
Ratio, alumina/silica	—	..	—	..	0·76

Coke from crucible test, sintered, contracted, not expanded.
Colour of ash, light pink.

The character of the coke indicates that the coal does not tend to "hang up" in the retort, and this was borne out in practice. The high percentage of acid insoluble in the ash, together with the moderate iron and lime percentage, show that this coal should be suitable in producer work, and should not give clinkering troubles. A coking test in the Lessing electric coking furnace gave the following results:

	Elphingstone Mixed Nuts.
Temperature of coking	900° C.
Duration of heating	7 min.
Coke	55·14 p.ct.
Carbon	1·98 p.ct.
Coke, *plus* carbon	57·12 p.ct.
Tar	12·04 p.ct.
Gas N.T.P.	214 cc. per gram.
Gas N.T.P.	7638 c.ft. per ton.
Coke	Well sintered, not expanded.

Rate of Gasification.

Volume of Gas after Min.	Sec.	Cc. per Gram. (Uncorrected).
—	15	6
—	30	18
1	—	50
1	30	86
2	—	126
2	30	168
3	—	196
3	30	207
4	—	214
4	30	219
5	—	223
5	30	227
6	—	229
6	30	232
7	—	234
Volume of gas after cooling		232

The gas yield shown was obtained in the laboratory, and is not, therefore, so good as normal results obtainable in ordinary gas-works practice, but is comparable with that obtained under similar small-scale experiments.

Analysis of Gases.

	Tully Gas. P.Ct.		Mixed Gas. P.Ct.
CO_2	3·4	..	3·2
O_2	0·8	..	1·0
CO	33·6	..	18·4
C_mH_n	1·2	..	2·8
CH_4	8 6	..	19·6
H_2	46·7	..	48·3
N_2 by difference	5·7	..	6·7
	100·0		100·0

Total inerts, 9·9 p.ct. | Total inerts, 10·9 p.ct.
B.Th.U., 380·8 gross. | B.Th.U., 490·7.
B.Th.U. per ton of coal, mixed gas, 9,602,999.

Comparing these figures with similar analyses by Mr. J. Dickson, of Johnstone [paper read before the North British Association of Gas Managers on April 8 last], it will be seen that the Tully process gives better thermal results to the extent of 1,768,699 B.Th.U. per ton of coal. I take the liberty of reproducing Mr. Dickson's figures as under:

Analysis of Mixed Gas.

CO_2	2·4
O_2	·2
C_mH_n	2·8
H_2	50·3
CO	19·6
CH_4	20·3
N_2 calculated	4·4
	100·0

Analysis of Blue Water Gas.

$CO_2 + H_2S$	3·9
O_2	0·0
C_mH_n	0·0
H_2	52·7
CO	39·0
CH_4	1·6
N_2 calculated	2·8
	100·0

Percentage of blue water gas in the mixed gas, 36.

Mixed Gas.

Calorific value by calorimeter	516 B.Th.U.
,, ,, calculated	499 ,,
Make of mixed gas per ton of coal	15,700 c.ft.
B.Th.U. per ton of coal	7,834,300

An excess of CO_2 over (say) 5 p.ct. accompanied by an increase of O_2 over 1 p.ct. and a corresponding deficiency in combustible constituents, may indicate leaky blast-valves and not necessarily a low temperature or excess of steam, as, naturally, if air is inadvertently admitted, some of the combustibles will be burnt-up. I particularly mention this fact as I have known cases where engineers have been misled in regard to the CO_2 content.

At the 70 million Scottish gas-works previously referred to, I obtained the following results during a month's working in February last:

		C.Ft.
Make per ton of coal,	Tully gas plant	50,000
,, ,, ,,	straight coal gas	11,000
,, ,, ,,	mixed gas	19,570
Tar		10 gallons
Liquor, 10 oz.		25 ,,

N.B.—At the works in question it does not now pay to make ammoniacal liquor; the cost of carriage being higher than the price received from the distillers. Recovery is not, therefore, kept at full pitch. It should also be noted that the plant is only working on the average about twelve hours per day, so that full efficiency is not obtained.

Comparative Costs of Gas Made at these Works.

	Pence per 1000 C.Ft.		
	Tully Gas, 380·8 B.Th.U.	Coal Gas, 575 B.Th.U.	Mixed Gas, 490·7 B.Th.U.
	d.	d.	d.
Coal	9·60	44·20	24·83
Labour	2·00	6·78	3·84
Total	11·60	50·98	28·67
Less residuals	1·00	26·90	9·69
Net cost	10·60	24·08	18·90

Net saving by new system, 5·18d. per 1000 c.ft., after allowing for fuel for steam-raising.

The proportion of gases in total: Tully, 55 p.ct.; coal gas, 45 p.ct.

Any general advocacy of the many advantages of the use of water gas would hardly be complete without some reference to the remarkable and fully authenticated results at Scunthorpe

Working Results at Scunthorpe. Month of March, 1921.

Fuel carbonized (gas coal)	342 tons coal.
Coal gas made	4,584,000 c.ft.
Ditto per ton of coal carbonized	12,000 c.ft.
Fuel for water gas (39½ tons coal and 22½ tons coke=)	62 tons.
Water gas made	4,250,000 c.ft.
Ditto per ton of coal and coke	68,548 c.ft.
Mixed gas made (from 381½ tons of coal)	8,834,000 c.ft.
Ditto per ton of coal carbonized	23,155 c.ft.
*Coke available for sale per ton of coal used	10·88 cwt.
Tar ,, ,, ,,	9·57 gallons
Percentage of water gas in total mixture	48·11

* Including coke used for steam-raising.

NOTE.—These results were obtained before the new water-gas plant was properly "tuned up;" and I have no doubt that very great improvements can yet be secured.

and Frodingham. The coal used here is a medium quality of mixed South Yorkshire coking gas coal, mostly small and friable, but producing a fairly good coke. I have recently completed tests on a new modified Tully gas generator at the Scunthorpe gas-works, and during the month of March last the average make of mixed gas was 23,125 c.ft. per ton of coal carbonized, equal to 11,007,500 B.Th.U., with 10·88 cwt. of coke and 9·57 gallons of tar available for sale per ton of coal used. The percentage of water gas in this case was 48·11 p.ct., and the make of water gas per ton of coal and coke was 68,548 c.ft. (39½ tons of coal and 22½ tons of coke).

Of even more interest, perhaps, are the results obtained over a whole year at Scunthorpe, as below. In this case the water gas was produced from coke, in an old water-gas plant, which was too small to provide all the water gas desired.

Working Results for Year ending March 31, 1921, Compared with the Corresponding Period of 1914.

		1914. Horizontals Only.		1921. Horizontals and Water Gas.
Coal carbonized	tons	5,306	..	5,013
Gas made	c.ft.	62,209,900	..	103,123,900
Gas made per ton of coal	c.ft.	11,724	..	20,571
Coke for sale per ton of coal (including coke used for steam-raising)	cwt.	8·28	..	7·57
Tar for sale per ton of coal	gallons	10·90	..	10·58
Quality of gas (approximate)	B.Th.U.	476	..	476
Percentage of water gas		*Nil*	..	41·84 p.ct.
B.Th.U. per ton of coal carbonized		5,580,424	..	9,791,796

Analyses of Gases at Scunthorpe, March, 1921.

	Water Gas without Liquid Enrichment. P.Ct.		Mixed Gas. P.Ct.
CO_2	5·6	..	5·8
O_2	*Nil*	..	1·0
CO	41·6	..	22·0
C_mH_n	·2	..	·9
CH_4	7·8	..	19·7
H_2	41·3	..	45·0
N_2 cal.	3·5	..	5·6
Total	100·00	..	100·00
Total inerts	9·1	..	12·4
Gross B.Th.U. (by calculation based on Lewes's formulæ)	375·1	..	476

Analysis of Gas from Same Coal and Plant plus Gas Tar Enrichment.

	P.Ct.
CO_2	5·60
O_2	·40
CO	31·80
C_mH_n	·20
CH_4	17·36
H_2	41·28
N_2 calculated	3·36
Total	100·00
Total inerts	9·34
Gross B.Th.U. (by calculation on Lewes's formulæ)	431

I have omitted giving detailed results with regard to gas-works solely distributing Tully gas, as I think this subject worthy of a separate paper; but I may say in passing that I have distributed Tully gas by itself with complete satisfaction to consumers when the appliances had been suitably adjusted.

The tar from the Tully plant has the general characteristics of that obtained by low-temperature carbonization. It has the non-aromatic smell resembling crude petroleum, which indicates the presence of paraffins or naphthenes.

The following is the analysis of a typical tar produced in Tully plants. A number of samples from different plants vary only to a small extent in the relative composition of oil and pitch.

Original Tar.	P.Ct.		P.Ct.
Water	7·09	..	7·09
Neutral oil	48·38	..	
Tar acids	14·90	..	
Tar bases	1·33	..	
Total oil			64·61
Soft pitch	7·89	..	
Hard pitch	13·65	..	
Free carbon	4·93	..	
Ash	0·66	..	
Total pitch		..	27·13
Undetermined		..	1·17
			100·00
Dry Tar.			
Neutral oil	52·07	..	
Tar acids	16·03	..	
Tar bases	1·43	..	
Total oil			69·53
Soft pitch	8·49	..	
Hard pitch	14·70	..	
Free carbon	5·30	..	
Ash	0·71	..	
Total pitch		..	29·20
Undetermined		..	1·27
			100·00

The colour test applied to the ammoniacal liquor—viz., the

colour test for cyanides, &c.—characterizes it as being very similar to that obtained in low-temperature carbonization.

The Tully, like any other water-gas plant, requires intelligent and regular attention in order to obtain full efficiency. But I have purposely avoided giving operating details of the plant as these have been ably dealt with by other authors—*i.e.*, paper by Mr. S. Moore, of Scunthorpe, contributed to the Eastern Counties Gas Managers' Association in the month of October, 1919; paper before the Scottish Junior Gas Association, December, 1920; and before the North British Association of Gas Managers, April, 1921, by Mr. Henry Rule, of Kelty, &c.

The Tully plant may be used as a gas producer, a water-gas plant, or as a suction producer with regulated amount of air and steam, giving a gas varying between 350 and 450 B.Th.U. gross.

SUMMARY OF THE ADVANTAGES OF THE USE OF TULLY GAS IN CONJUNCTION WITH ORDINARY COAL-GAS PLANTS.

(1) Less labour required than with coal-gas installations.
(2) Less dependence upon any particular class of labour.
(3) Reduced price per therm to the consumer.
(4) Costs of purification greatly reduced.
(5) Less dependence upon regular supplies of coal.
(6) Much better thermal efficiency per ton of coal.
(7) A regular standard quality of gas more easily secured.
(8) Lower content of inerts in the mixed gases, which need not exceed 12 per cent.
(9) Surplus coke can be used for making water gas, thus ensuring better control of the local coke market.
(10) Ease in dealing with sudden peak loads, thus avoiding the necessity of keeping settings under fire.

The foregoing paper and that by Mr. Robinson [see p. 327] were discussed together.

DISCUSSION.

THE PRESIDENT (Mr. A. W. Branson), in opening a discussion on the papers, said they could not have had more immediately interesting subjects before them than had been dealt with by Mr. Chester and Mr. Robinson. The subjects they raised were indeed important at the present time. Complete gasification was certainly what they would all like to adopt, at any rate, for the time being.

Mr. HERBERT LEES (Hexham) said he had had some personal experience with one of the plants—that dealt with by Mr. Chester. Before the end of the winter of 1920, it was quite evident to him that some steps would have to be taken to improve the carbonizing plant at the works in which he was engaged. The existing horizontal plant was about 40 years old, and they would understand that it was high time for it to be renewed or replaced. How to replace or renew it was the problem. One did not wish to begin the construction of an ordinary horizontal bench, owing to lack of room. Verticals naturally appealed to them; but the first cost made it absolutely impossible at that time, and even at the present time. The main trouble—and it was a general trouble—was the raising of the capital expenditure. Eventually they decided that the Tully plant provided some advantages. His original intention was to mix with coal gas and produce a quality of 450 B.Th.U., if not more. He had hopes when he commenced operations to produce much more than he had yet attained. In their case, they had managed to make gas of some 300 to 330 B.Th.U. as a normal; but undoubtedly in the minds of those interested in the plant there was a hope that something more would be attained from it. In Mr. Chester's paper there was more than a suggestion of this being possible, and there was a suggestion of the same sort in Mr. Robinson's paper. Mr. Robinson mentioned 450 B.Th.U. quality, and Mr. Chester made references to qualities of 450 B.Th.U. being obtainable in his plant. What he would like to know was how it was possible to produce gas of such qualities from those plants alone, apart from the admixture of coal gas. If it were possible, then they had carried the question a great deal further than had generally been done in regard to complete gasification. He had read with great interest not only the results mentioned in the papers just read, but also in other papers on the same subject read elsewhere. He felt bound to say that his own works fell far below what other people in some places were stated to have accomplished. He was encouraged, however, by reading Mr. West's paper on the Newark works and finding that his results on a Tully plant were not greatly in excess of his own. He felt that there must be something extraordinary about the plants—something about the methods of working or something about the quality of the coal which produced a quality of 476 B.Th.U., and so on. There were many people besides himself, he was assured, who wished they could get better results from the plants than they were obtaining. He was bound to say that he had not the slightest cause for complaint against the firm who had installed his plant; they had given every assistance, and he had had valuable assistance from Mr. Chester on one occasion. It would be helpful to those on small works to know of the difficulties one met with, for they all obtained successes by recounting frankly their failures and their difficulties. At Hexham they first made the admixture of the gas from the plant at a point on the foul main between the retort-house governor and the hydraulic main. He did this on advice and rather against his own judgment. The results obtained by this method were not satisfactory. They then changed the point of inlet to the foul-gas main to the other side of the retort-house governor. The result was an immediate increase in the yield per ton. The best results they had obtained on the mixed gas—and he could vouch for no other—were 16,956 c.ft. during the month of April, using 10 p.ct. of coke on the total coal used. In March, they obtained 16,310 c.ft.; but in this case they used a smaller proportion of coke—about 5 p.ct. He noticed figures in Mr. Chester's paper giving in 1914 a quality of gas at 476 B.Th.U., and in 1921 also a quality of 476 B.Th.U. He had no doubt these results had been carefully taken and recorded; but he would like Mr. Chester to tell them how it was done. He wished to say, however, that in his own case, despite certain disappointments, he was quite satisfied they did the right thing in installing the plant when they did; and he was very hopeful that the plant would yet do a good deal more than it had done up to the present. It was becoming a very serious problem for many small undertakings to know quite what to do in the way of reconstruction; and if relief could come from any system for the small undertakings at a comparatively low capital expenditure, it would be a great benefit.

Mr. C. DRU DRURY (Sunderland) said he was particularly interested in Mr. Robinson's paper, as it dealt with economy to a large extent. It should not be forgotten, however, that modern water-gas plants were now being arranged to deal with waste heat by way of the boilers, and that economy would be generally obtained. He had not seen Mr. Robinson's setting; but from what he had gathered, there were certain difficulties which would likely present themselves. It was not clear, for instance, how he would prevent the escape of gas through the retorts when discharging and clinkering. It was not clear to him how Mr. Robinson managed to get the coke pushed up by hand if the retort was 14 ft. long. He did not give the cost of manufacturing by his process; but he thought it must be higher than complete gasification, for there was more labour employed in charging and discharging. In the smaller settings, he imagined that the lot of the fireman would be a very arduous one indeed. The arrangement did not appear to him to be so flexible as an independent water-gas plant. He, too, would like to know how either of the plants described that day could produce gas of 450 B.Th.U. He would like to know whether the Tully plant would carbonize Durham caking coal. In Mr. Robinson's plant it would seem that he would carbonize any sort of coal; but in the Tully plant it would appear it required special coal, and such a coal that would not be easily obtained in the county of Durham.

Dr. G. WEYMAN (Newcastle) said it seemed to him there would be considerable fluctuating of temperatures in Mr. Robinson's plant. He would like to know how it affected the setting. In both papers there appeared to be a desire to obtain low-temperature tar. He did not know whether in the future low-temperature tar might be more valuable, but at the present time it was rather doubtful. He could not see that low-temperature tar was particularly desirable just now. Perhaps the naphthalene which was absent in the low-temperature tar was not of much use; but when naphthalene was absent anthracene was also absent, and anthracene had been at one time of considerable importance, and might be again.

Dr. W. B. DAVIDSON (Newcastle) said that his experience had been that to make water gas was more costly than coal gas given a reasonable market for coal. That was so far as cost per therm was concerned. He would like to see the details of the costs referred to in Mr. Chester's paper. If it were true that one could reduce the price per therm by one-third, it would pay all the large gas companies to scrap their plants and go in for Tully plants. Mr. Chester had given them a whole list of advantages; but they could hardly expect him to give a list of disadvantages. Still it would be very interesting to know the whole truth in all its details. He could not understand how the cost of purification should be reduced; the usual experience, he thought, was that the cost of purifying water gas was higher than coal gas. Mr. Robinson's paper was a very valuable one, though it took the form of a modest account of what he had done. He hoped he would continue the work and make even more progress.

Mr. S. SHADBOLT (South Bank) said he was glad to express his appreciation of both papers, and especially to identify himself with the remarks of Mr. Lees, as being one of the persons anxious to secure as nearly as possible the good things one read about. One could not but regret that, though they had so many aims in common, the complications which existed in various places made comparisons very difficult. So far as the costs question was concerned, they had not yet got away from costs per foot, whereas they must get into the way of costs per therm. He was sure that none of them were ever wrong. They were all right, but they never got on the same line at the same moment when making comparisons. Many of the figures given were only very vague when one applied them to one's own case. Their present unknown liberty, and the question of the standard of gas for the future, found them all once more aiming at and looking for a different thing. The question of the 450 standard was one of those things more often talked about than actually obtained; and it was as well to acknowledge this. The estimate of Mr. Chester regarding the reactions in the Tully plant he described as being very speculative, and might be criticized a great deal. He did not think the low-temperature people would care to "father" some of the conclusions. At all events, there was no doubt that they were faced with a common problem, apart altogether from the incident of the coal stoppage, and that was that there was a growing demand for gas at a time when capital outlay had to be kept down. He believed they were rapidly approaching the day of a lower standard of B.Th.U., and there was little doubt that total gasification, combined with present-day practice, was where they were all tending.

Mr. F. C. WILLIS (Tynemouth) said he quite agreed that the problem of complete gasification was one right in the forefront to-day. To those with large horizontals, with an enormous tonnage to be dealt with and with the extreme uncertainty in the coke market, the subject raised by Mr. Robinson was a very attractive one. He took it that the author was simply dealing with hand-charged plants, and he wondered whether he had thought of applying the system to a large-scale plant with machine charging. They did not want to go back to hand-charged retorts. It seemed to him there would be a difficulty to overcome with regard to the expansion of the retorts. The stiffening of the back walls of his setting would seem to present a difficulty after a year or two continuously working, particularly with a machine of the pusher type. It would be interesting to see the application to retort sets of 20 ft. long, to see how he would get over the weakening of the back wall of his retort.

The PRESIDENT, in moving a vote of thanks to the authors for the papers, said he re-echoed the wish of Dr. Davidson, that Mr. Robinson would carry on to success. The plant he had described had certainly a future in small works; but he could not understand the larger works multiplying such a plant, as the labour seemed to be out of all proportion to the output, and the capital, when multiplied four or five times, would be out of proportion to the output. It seemed to show very good

results from a thermal efficiency point of view; but, as Mr. Drury had pointed out, water-gas plants were being fitted with waste-heat boilers, and a great deal of economical working would be gained in this way. A very practical point was to ask what became of the gas while clinkering was going on. He was not clear as to how waste could be avoided. The plant was one which promised well for small works. He had no experience with the Tully plant, but had been interested in the discussion. Mr. Lees' experience was a warning not to expect too much from any plant.

Mr. Chester briefly replied to the vote of thanks, and referred to one or two points in the discussion. He was pleased with the very frank way in which the paper had been discussed. Mr. Lees had asked him to explain how the increased quality could be obtained. The increased quality was obtained at the expense of some of the coke, and also, to a certain extent, at the expense of the nominal output of the plant. He thought he could discuss it better with Mr. Lees later, and intimated that there was a great deal of truth in Mr. Shadbolt's remarks on the difficulty of making reliable comparisons. He had met many engineers experiencing the same difficulties as Mr. Lees; but after careful investigation and certain alterations, the make per ton of mixed gas had been vastly increased. Regarding the 476 B.Th.U. quality in 1914 mentioned in the paper, he could not vouch for that—it was taken from Mr. Moore's records, and the analysis of several chemists; but he could vouch for the 476 B.Th.U. of his own records—they were his own tests. Regarding Mr. Drury's query as to whether there was a plant designed especially to deal with Durham caking coal, he could not say there was as yet; but he believed there soon would be. He had come across works recently where they were using South Yorkshire caking gas coal with no addition of coke in a Tully plant. In that case steam was slowly carried through the retort. He had come to the conclusion that, providing one passed sufficient hot water gas through the coal charge, one got over the caking property of the coal and drove out the tar, and the steam down the retort assisted to drive the hydrocarbons into the fuel bed. Steaming down the retort had overcome the difficulty in some places. Regarding Dr. Weyman's point, that if the naphthalene were absent there would also be an absence of anthracene, this might reduce the value of the tar if anthracene were again valuable; but there was the consideration that there would be no naphthalene in the gas produced, and most gas engineers would agree that naphthalene in the gas had been a humbug ever since gas was used. He thought the absence of naphthalene in the tar was overridden by the advantage of its absence in the gas. He agreed with Mr. Shadbolt that his conception of the reaction taking place in the Tully plant was purely speculative, and should not be taken as an accurate estimate; but, on the whole, he thought his figures were reasonable.

Mr. Robinson, replying to the discussion and the vote of thanks, referred to his paper as a very modest effort to put some experimental work before them. Regarding Mr. Lees' remarks on the 450 B.Th.U. quality of the gas, he would remind him that 458, 446, and 437 were just extracts from daily tests, and further on in the paper the average from Jan. 12 to Jan. 26 was 384 B.Th.U. (gross). This was daily working. At that time they were working with a $\frac{1}{4}$-in., instead of a $\frac{3}{8}$-in., hole in the disc, and lengthened the blow. They obtained a higher heat in the retorts and a greater proportion of coal gas than at present. They used any sort of coal that came to hand—at present a mixture of Durham and West Yorkshire. The economy of waste-heat boilers could be claimed for his plant equally with others. He agreed there was bound to be an escape of gas during clinkering operations; and for this reason in all calculations in the paper he allowed only twenty working hours per day, as four hours gave a large margin for cleaning, &c. The plant was designed for pulling out by machinery and by hand. With regard to scurfing, they had not done any, as there was no sign of scurf. He did not agree that the plant was not so flexible as separate water-gas plant. He thought it was more flexible. It could be used as a blue gas or mixed gas process. He had not observed any ill-effects from the variations of heat mentioned by Dr. Weyman. He admitted that on his basis of calculations there was not much in it as regarded the output of therms; but he was hoping for better results still, and had been very conservative in his figures. With regard to the expansion of the retorts and the stiffening of the back walls, the walls had not yet moved; and they did use a machine of the pusher type. No sign of damage was noticeable as a result. He could only say, with regard to the President's remarks that the labour was out of all proportion to the output, that at the present time the man working it had a very soft job, and could look after three as easily as one. Mr. Robinson replied to the question of the cost of manufacture by the following summary of comparative costs:

Basis 1,000,000 c.ft. at 480 B.Th.U.				4800 therms	
Coal gas	6,500,000 B.Th.U. per ton =			65	,,
	18,000,000 ,, ,, =			180	,,
Coal gas—					
Coal $\frac{4800}{65}$ = 73·8 tons at 43s. =				£158	13 5
Less—					
Coke, 37 tons at 40s. =		£74	0 0		
Tar, 3·7 ,, ,, £3 =		11	2 0		
Liquor 9 ,, ,, 8s. =		3	12 0		
				88	14 0
				£69	19 5
= 16·79d. per 1000 c.ft. or 3·5d. per therm.					
Complete gasification—					
Coal $\frac{4800}{1800}$ = 26·7 tons coal at 43s. =				£57	8 1
Less—					
Coke, *Nil*					
Tar, $1\frac{1}{2}$ tons at £3 5s. =		£4	17 6		
Liquor, $3\frac{1}{2}$,, ,, 8s. =		1	8 0		
				6	5 6
				£51	2 7

= 12·27d. per 1000 c.ft. or 2·5d. per therm.

Saving 1d. per therm. In the case of Harrogate, it meant £8400 a year. Carbonizing wages were less on complete gasification than straight coal gas; but these were ignored in the foregoing figures, as conditions varied so much in different towns.

To bring costs equal, coke would have to be sold at 7s. a ton over the price paid for the coal.

The saving in capital expenditure on scrubbers and purifiers, coal store, and haulage coke-handling plant was considerable.

About 60 p.ct. of sulphur in coal was driven off in ordinary distillation. In complete gasification they could assume that all sulphur was driven off, and that there was 1·5 p.ct. sulphur in coal.

In ordinary distillation 100 tons of coal gave 0·9 ton of sulphur in the foul gas; while in complete gasification 100 tons of coal gave 1·5 tons of sulphur in the foul gas. But as only about one-third the quantity of coal was gasified for a given make of gas, the quantity of sulphur to be dealt with would be 0·5 ton. Thus purifiers would have to deal with only about half the usual impurities for a given output. A similar argument could be used for scrubbing plant. As regarded coal stores and haulage, extensions of coal-stores could be deferred many years, and the present available storage increased almost three-fold. Motors and carts would be likewise reduced in number. Coke-handling plant would not be required. In the case of Harrogate, the deferred expenditure on capital would be about £50,000, representing, at 8 p.ct., £4000 a year in interest, equal to 2½d. per 1000 c.ft., or ½d. per therm.

Mr. Robinson also handed to the members reports on two samples of tar from the Harrogate undertaking, which were examined at the Department of Coal Gas and Fuel Industries at Leeds University:

Sample Marked A (Patent Setting).

The sample consisted of about 2 gallons of tar. Some water had separated on the surface of same. This was poured off and measured (197 c.c.). The sample for analysis was taken from the residue.

Specific gravity	1·12
Distillation Test.	Per Cent.
Water	5·2
Light oils to 170° C.	1·6
Oil, 170° to 230°	3·4
,, 230° to 270°	13·8
,, 270° to 300°	7·2
Residue (pitch)	68·8
	100·0

No naphthalene separated from any of the oils on standing overnight. The pitch was fairly hard.

Sample Marked B (Horizontals).

The sample consisted of about 2 gallons of tar. No water had separated from the sample.

Specific gravity	1·20
Distillation Test.	Per Cent.
Water	3·5
Light oils up to 170°	1·3
Oil, 170° to 230°	5·2
,, 230° to 270°	16·3
,, 270° to 300°	5·1
Residue (pitch)	68·6
	100·0

Fractions 170° to 230° and 230° to 270° were rich in naphthalene, which was deposited on cooling, so that the mass became semi-solid.

Fractions 270° to 300° also deposited a considerable crop of crystals.

The pitch was rather soft.

	A.	B.
Fraction 0° to 170°.		
Loss on washing with NaOH (phenols)	32 p.ct.	12 2 p.ct.
Loss on washing with H_2SO_4 (unsaturated compounds)	8·5 p.ct.	14·6 p.ct.
Residue fractionated up to 140° (specific gravity of fraction 0° to 140°)	0·862 p.ct.	0·879 p.ct.
Fraction 170° to 230°.		
Loss on washing with NaOH (phenols)	54	38
Naphthalene	*Nil*	47 p.ct.
Fraction 230° to 270°.		
Loss on washing with NaOH (phenols)	35 p.ct.	16 p.ct.
Free carbon in tar	2·9 p.ct.	19·2 p.ct.

These figures, and those reported for the distillation tests, point to the same conclusion as to the character of the tars.

Sample B seems very like the tars now produced in horizontal retorts at high heats.

Sample A is a very different tar, and shows a closer approximation to the low-temperature type.

Characteristics are the low specific gravity of the tar and of the light-oil fractions, which indicates the presence of paraffins, the high proportion of tar acids or phenols in the middle oils, and the low percentage of free carbon in the tar. The absence of naphthalene is very striking, and also confirmatory of this conclusion. Fraction 170° to 230° of Sample A gave no precipitate at all with picric acid.

The Inerts Committee.—There will be a further meeting on Wednesday, the 25th inst., for the purpose of taking evidence, of the Committee on the Limitation of Inerts.

An Exhibition by the Institution of Mechanical Engineers.—A feature of the two-day conference on the means of increasing the thermal efficiency of heat power plants which is being organized by the Institution of Mechanical Engineers will be an exhibition of all kinds of appliances connected with boiler-room economy and with the efficient use of steam and internal-combustion engines. The exhibition will be held on June 30 and July 1; and the Institution desire that all those who have exhibits to offer will put themselves as soon as possible in communication with the Secretary, Storey's Gate, St. James's Park, S.W. Although apparatus and models will be preferred, drawings will be accepted and provision made for their convenient display. The papers at the conference will be devoted to subjects connected with the better utilization of fuels of all kinds.

EXPERIMENTS IN COMPLETE GASIFICATION AT HARROGATE.

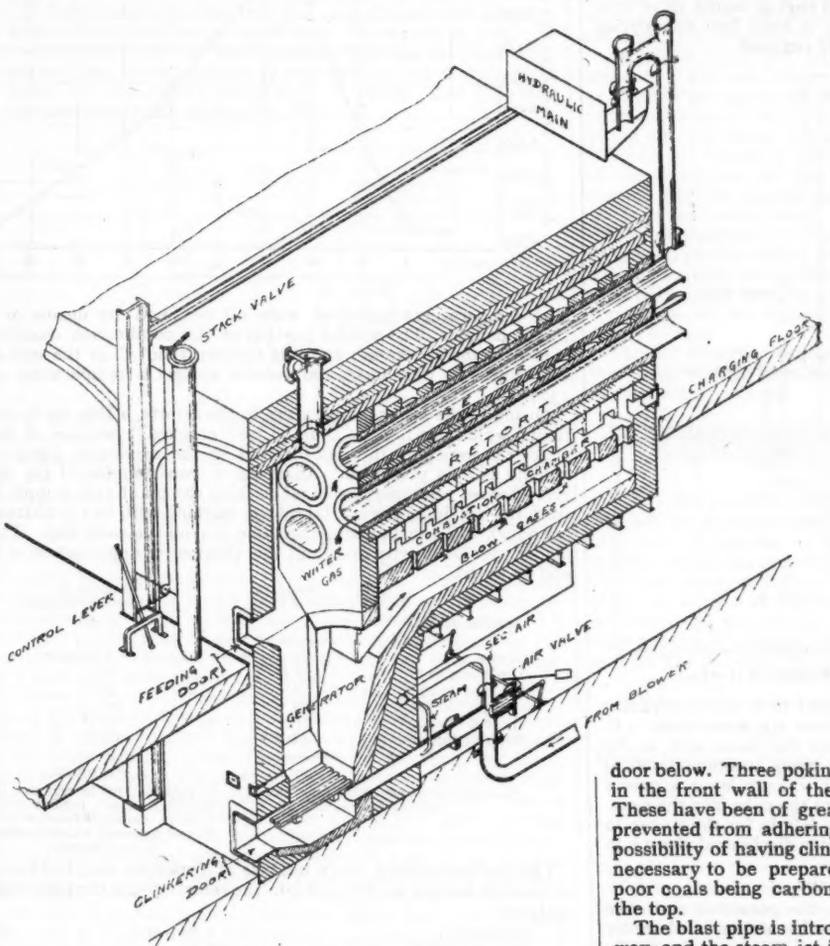
By FRANK H. ROBINSON, Assoc.M.Inst.C.E.

[A Paper read before the North of England Gas Managers' Association, May 6.]

This paper is merely an account of what has been done at Harrogate during the last eight months under everyday working conditions, so that the tests could not be carried out as completely as is desirable. It was not until Easter week-end that we could afford to shut-down any of the carbonizing plant to make a lengthy test of the output of the setting to be described; but I hope that such information as is contained in the paper will prove interesting and also help to increase our knowledge of the most important part of our business—the carbonization of coal.

In the winter of 1919-20, we were faced with the problem how to increase the output of the retort-house without incurring heavy capital expenditure, and at the same time how to turn out a low-grade gas without an excessive amount of inerts.

The carbonizing plant consisted of the following: 16 vertical retorts (Woodall-Duckham); 8 beds of machine-charged horizontals (64 retorts); 4 beds of obsolete hand-charged horizontals (32 retorts). The whole of the verticals and the horizontals were fully at work most of that winter; and the only reserves were the four old beds, which were worn-out working every Sunday, and working 8-hour charges instead of 12-hour—the usual custom. It became necessary, in view of the increasing consumption, to make provision for the next winter.



Robinson's Mixed-Gas Plant.

Tenders for water-gas plants (blue and carburetted) were obtained; but when the scheme was carefully considered, it was found that the capital cost was so high as to put it out of the question, especially in view of the difficulty in raising money and certainly till a fall in prices should take place. There were also other disadvantages in installing such a plant. (1) The plant would be separated from the retort-house, thus involving labour in handling coke. (2) A new building would have been required to house the plant, or an existing building altered to suit. (3) Coke drawn from the retorts would have to be quenched and screened, resulting in a waste of heat units and labour.

The question now arose as to how these disadvantages could be met without going outside the retort-house. Steaming of the verticals is practised; but it is found with our retorts that, in order to obtain satisfactory results, the speed of working has to be reduced (especially with the dusty coal we have had to use lately) so that the output of gas is increased very little. The only advantage is to save coal and produce low-grade gas without a high percentage of nitrogen. After much consideration I arrived at the arrangement to be described.

CONSTRUCTION.

Briefly, the plant is a horizontal retort-setting with a water-gas generator at one end, the whole accommodated within the arch of the retort-bench. In adopting this arrangement, the disadvantages enumerated previously are overcome. The arrangement was submitted to my Board as an alternative to a water-gas plant, with the result that I was instructed to erect one setting as an experiment in place of one of the old worn-out settings—the expense being, of course, chargeable to revenue. I should here express my gratitude to my Directors for this concession, as many boards and committees are reluctant to permit such experiments to be made. The entire setting—retorts, generator, and flues—was taken out, leaving the empty arch. Mouthpieces and ascension pipes were put at one side for re-use. The hydraulic and foul mains were left in position on one side and removed from the other. The old bricks were all cleaned and afterwards used up; the retorts were cut; and the good portions retained. The retorts, eight in number, are 14 ft. long by 22 in. by 16 in. Ω-shaped, set in three tiers. The number and arrangement can be varied to suit local circumstances; but the grate area of the generator should be proportional to the length, number, and size of retorts.

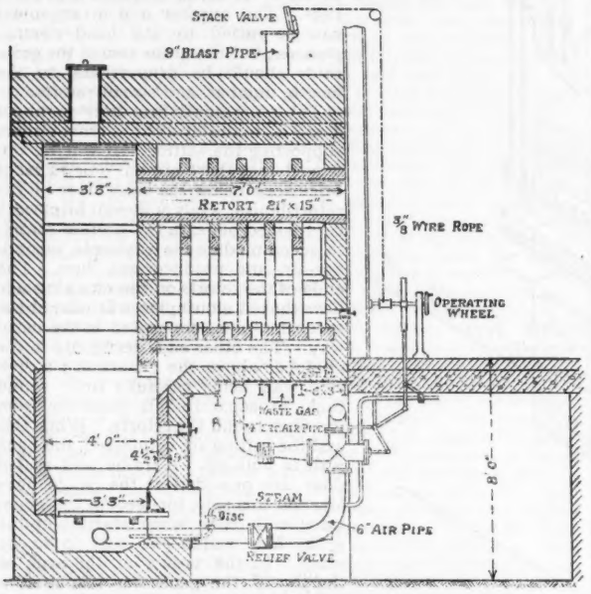
The generator is first built-up about 7 or 8 ft., to the level of the cross girders supporting the setting. It will be observed that there are but 9 or 12 in. of brickwork below the stage floor of the retort-house. Only sufficient brickwork is provided beneath the bottom retorts to accommodate the waste-gas, secondary-air, and producer-gas flues. The ends of the retorts on the charging side have the old mouthpieces fitted and the ascension pipes connected in the usual way. The other ends terminate in the chamber above the generator; a division wall being carefully built round them to separate this chamber from the flues round the retorts. When this and the setting are completed, the back wall is built-up. A frame and sealed door are provided at the stage floor level on this side, for feeding the generator with coke when starting-up or when blue water gas only is to be made. In the crown of the arch at the top of the generator chamber, a pipe with a gas-tight cover is provided which is useful in emergency to enable clinker to be removed from the walls of the generator which may be beyond the reach of the man at the clinkering door below. Three poking holes with gas-tight covers are provided in the front wall of the generator about 2 ft. above the grate. These have been of great benefit, as by regular use the clinker is prevented from adhering to the walls at their level, and so the possibility of having clinker higher up is reduced. It is, however, necessary to be prepared for this contingency, in the event of poor coals being carbonized; hence the provision of the pipe at the top.

The blast pipe is introduced below the grate bars in the usual way, and the steam jet is inserted in this pipe, pointing towards the generator, just outside the wall. A disc is inserted between two flanges near this point for the regulation of the steam. Arising from the blast main outside the generator is a smaller pipe conveying secondary air to the combustion chamber of the setting. A piston-valve opens both ports at the same time, and so primary and secondary air supplies are admitted and shut-off simultaneously. This valve, the steam jet, the steam supply to the blowing engine, and the stack valve are all connected together, so that only one movement is necessary to change from "blow" to "run," or *vice versâ*. The blowing was at first done by an old steam-driven exhauster. This did quite well up to a certain point; but it was found that a larger quantity of air was required than the exhauster would give, and so an 8-in. high-speed fan was substituted. The levers and steam connections are so arranged that when the change is made from blow to run, the engine slows-down, and at the reverse operation increases speed; and a saving in steam and wear-and-tear is effected.

The firebrick work was done by a bricklayer employed by Messrs. Drakes, Ltd., who also supplied the special valves and pipes for the air system, blast pipes, and furnace fittings. The unskilled labour was provided by the Harrogate Gas Company. The bricks used were, for the most part, those which had been in the setting before; and the retorts when shortened were also usable. The old mouthpieces, ascension pipes, hydraulic mains,

girders, and all the rest of the ironwork were re-erected by the Company's workmen, who also did the small amount of fitting work required.

The total cost of the setting, making 150,000 to 200,000 c.ft. per day, was £860, including the dismantling of the old setting, cleaning and re-erecting the steam-engine and blower and the steam piping, all the above-mentioned work, and new firebricks for the outside walls. This figure also includes all experimental work, the changing of the blower and the alteration of the air-main to suit, and also the changing of the drive from the engine. The output from the setting could be greatly increased by a further enlargement of the blowing plant, as the grate area and the capacity of the generator are sufficient for a much greater production. The cost of such a setting of eight retorts in a "through" arch, with all new material, would of course be very much higher, but less than a similar regenerator setting. There is only about two-thirds the brickwork in this setting compared with a regenerator setting, half the number of mouthpieces, ascension pipes, hydraulic and foul mains, valves, &c.; but one must set against this saving the cost of blower, engine, blast mains, and controlling mechanism. In 1920 we had erected for us a regenerator setting of eight "through" retorts, including all ironwork. This cost £2330 in all. To have erected a setting for complete gasification, including all new firebrick, ironwork, blower, and engine, would have cost £2100 at that time. Where a setting is built into an existing arch, the cost is, of course, considerably reduced.



The Robinson Mixed-Gas Plant at Richmond (Yorks.).

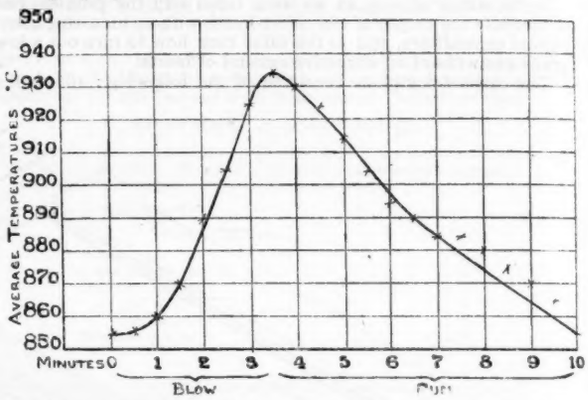
The system can be applied equally well to a works requiring "single" retorts. In this case the retorts are made about 7 ft. long, and the clinkering door is fixed on the same side as the mouthpieces; the blast main and valve being accommodated at the side of the space beneath the retorts, so as to leave a means of access to this door. When pushing-out the coke into the generator, about 9 or 12 in. of the charge is left in for the stoker to throw against, so as to prevent the coal being discharged direct into the generator.

Method of Working.

When starting-up, a fire is lighted in the generator and coke is supplied through the feeding frame, with air supplied under natural draught and all sight-boxes open. These are gradually closed, beginning with those nearest the generator, until the gases are circulating round the retorts and away to the stack-valves. A little secondary air is admitted from the first so as to reduce the risk of an explosion; and this is gradually increased until a steady flame is obtained in the combustion chamber. As soon as this is obtained, the blower may be started and the production of blue gas commenced. During the blow, the producer gas leaves the generator at the back and enters a flue from which it issues through nostrils into a combustion chamber in the ordinary way. Combustion and the circulation of the gases round the retorts take place in the usual way; and the waste gases are led away to the stack-valve by means of flues and pipes. Colour is very soon seen in the retorts, which will be ready for a charge of coal in about two days. If it is desired to hurry this up, the blow is lengthened and the run shortened. During the latter, the water gas passes from the generator into and through the retorts and away to the ascension pipes. The heat of the hot water gas is thus utilized. After the first charge of coal is burnt-off, the retorts are taken in turn at regular intervals; the coke being pushed-out into the generator and the retorts charged again. During this operation, the blower and steam jet are of course shut-off.

The large chamber at the end of the retorts and above the generator has a definite purpose. During the blow, the producer gas is passing through the setting and away to the stack-valve after combustion, and naturally follows the easiest course. The seal on the dip-pipes is set to obtain this. The coal gas is thus trapped in the retorts, and, being produced all the time the blow is in operation, issues from the retorts back into this chamber which is of sufficient capacity to hold all the coal gas produced in 6 or 7 minutes before the producer gas outlet is reached. On the blow being changed to run, the water gas sweeps back the cool gas away through the retorts into the mains before any is wasted, as the normal period of the blow does not exceed four minutes. It is also found that no scavenging is required as, when the stack-valve is closed during the run, the producer and waste gases are trapped in the setting and the water gas passes direct into the retorts without coming into contact with the blow gases. The two gases have independent directions in which to travel; and each way is shut-off from the other.

The production of water gas takes place in the usual way; but the coal gas is produced at a comparatively low temperature. The temperature of the combustion chamber is shown on the accompanying chart:



The temperatures indicated were all obtained by means of a thermocouple. The hottest portion of the combustion chamber is nearest the generator; and this reaches 1080° C. at the end of the blow. In our horizontal retorts we get a temperature of 1300° C.

Owing to the lower temperature in the retorts, a thin tar is obtained which has had no time to be "cracked" because of the water gas sweeping the gas forward to the ascension pipes as quickly as it is produced. Analyses of two samples of tar are given below. Sample A was taken from the plant and sample B from the adjoining horizontal retorts working with heavy charges (12-hour), when carbonizing the same coal on the same day. The higher specific gravity of B and the absence of naphthalene in A will be noted.

	Sample A. From Plant.		Sample B. From Horizontals.
Specific gravity	1·12	..	1·20
Water	5·2 p.ct.	..	3·5 p.ct.
Light oils to 170° C.	1·6 ,,	..	1·3 ,,
Oil, 170° to 230°	3·4 ,,	..	5·2* ,,
,, 230° to 270°	13·8 ,,	..	16·3* ,,
,, 270° to 300°	7·2 ,,	..	5·1* ,,
Residue (pitch)	68·8 ,,	..	68·6 ,,
	100·0 p.ct.	..	100·0 p.ct.

No naphthalene separated from oils on standing overnight.

* Fractions 170° to 270° rich in naphthalene, and became semi-solid on cooling. Fraction 270° to 300° deposited a considerable crop of crystals.

The coal carbonized was a mixture of Yorkshire and Durham, an average sample as charged into the retorts giving the following analysis:

Moisture	2·87 p.ct.	
Volatile matter	29·50 ,,	Dry basis
Fixed carbon	57·00 ,,	Dry basis
Ash	13·50 ,,	Dry basis

The coal was tested according to the American Bureau of Standards Test, using a platinum crucible with fixed height of flame and period of burning-off.

The temperature of the waste gases, taken by means of an iron-constantan thermocouple at a point 12 inches below the stack-valve, is found to be 290° C. at the commencement of the three-minute blow, and rises to 475° C. at the end. No flame appears at the stack-valve as in most water-gas plants—the whole of the carbon monoxide being consumed in the setting, thus resulting in economy of fuel.

The setting is connected to the foul mains in the retort-house, so that the hot water gas may pick-up from the tar vapour therein the lighter hydrocarbons and so become enriched.

With present-day coals containing 10 to 15 p.ct. of ash, we clinker every eight hours—*i.e.*, once a shift. During clinkering, the plant is stopped in the blow position. If it is desired to shut-down the plant for a few hours (as on Sundays and at other times of reduced demand), the lever is fixed in the run position and the steam shut-off. The coal gas still coming-off then breaks the seal in the hydraulic main in the usual way, as no other way of escape for the gas is open.

If it is desired to carbonize the tar, instead of the water gas passing through the retorts, the coal gas issues out of them into

the generator, through the coke into the setting, and away to the stack-valve pipe, which can be provided with a branch and seal-pot. The drawbacks to this method are (*a*) that coal gas is wasted during the blow, as in some plants for complete gasification; (*b*) that the heat from the hot water gas is not so effectively transmitted to the coal in the retorts through having to pass through 3 inches of material, instead of being in direct contact; (*c*) that the fuel oils are totally destroyed; and (*d*) that scavenging would be necessary if inerts are to be kept low. This has not yet been tried, but, as an experiment, I hope to do so before long.

WORKING RESULTS.

As the plant is connected to the existing hydraulic mains, it has not been possible to make extended tests. The longest test we made was on Good Friday, March 25, 1921. Frequent tests of calorific value and carbon dioxide have been made over the last four months. A test holder of about 30 c.ft. capacity is connected to the foul main close to the setting, and before the gas passes through the foul mains of the retort-settings. From this holder the gas is passed through a washer and purifier before being tested. The sample is taken over the whole seven minutes' run, so as to obtain an average and not a "snap" sample. I have seen tests published as indicative of the working results from a plant with a "snap" sample taken about half way through the run; it being assumed that this will give the correct average. No such method has been adopted here. A sample of 30 c.ft. is taken every time over the whole period of the run, the plant being temporarily put under pressure to keep out any air which might be drawn in through any leaky caps or joints. The following shows some tests made on various dates:

Date.	Calorific Value. Gross.	CO_2.	CO.	Remarks.
		P.Ct.	P.Ct.	
Jan. 4, 1921 . .	458	4·0	—	Coal only.
,, 12 ,, . .	330	3·4	35·3	,, ,,
,, 17 ,, . .	446	4·5	34·2	,, ,,
Feb. 5 ,, . .	358	6·8	27·2	,, ,,
,, 17 ,, . .	437	5·0	28·0	,, ,,
,, 21 ,, . .	249	10·8	11·8	Coke only. Low steam pressure; less boiler plant working.
,, 23 ,, . .	246	10·2	13·4	
,, 24 ,, . .	233	10·8	18·9	
Mar. 7 ,, . .	254	10·8	19·2	
,, 19 ,, . .	396	8·1	23·4	

It will be observed that when the steam pressure is low—under 40 lbs.—the CO_2 increases at the expense of the CO. With such a low pressure, the necessary speed cannot be obtained on the fan, and consequently the temperature of the generator is not raised sufficiently to enable the water-gas reaction to take place. Given a good steady speed on the fan and limiting the steam supply to the generator, a gas containing not more than 3½ p.ct. of CO_2 can be obtained. To produce the higher quality gas, the blow may be lengthened and the run reduced. But this is not so economical of fuel as the alternative method of reducing the steam during the run while leaving the periods the same. To produce a lower grade of gas, as free from inerts as possible, the retorts would be charged less frequently and the generator supplied with coke sufficient to keep it full.

If inerts are not objected to, the seal can be reduced and a portion of the blow gases with reduced secondary air passed into the mains, or the steam supply increased. There is a great drawback to this latter method, as the temperature of the generator is reduced so far below the requisite temperature for reaction to take place that it is doubtful whether more than about a foot or so of the fire is raised to that temperature during the blow. In fact tests have been made with the pyrometer, and we have found—starting with an initial temperature of about 1200° C. at the end of the blow—that each succeeding blow was about 40° C. less than the preceding one.

We aim at keeping the CO_2 between 6 and 8 p.ct., and get gas about 370 B.Th.U. gross. After many experiments, the periods of three and seven minutes for blow and run respectively were found to give these results and to be satisfactory in other ways. The following are recent complete analyses of the gas made and purified:

	March 24, 1921.	April 7, 1921.
CO_2	8·4 p.ct.	6·4 p.ct.
O_2	0·2 ,,	0·5 ,,
Illuminants	1·4 ,,	1·0 ,,
CO	18·9 ,,	27·7 ,,
CH_4	17·42 ,,	12·62 ,,
H	39·26 ,,	44·86 ,,
N (by difference)	14·42 ,,	6·32 ,,
	100·00	100·00
Calculated calorific value	393·9 (gross)	382·7 (gross)
Actual ,, ,,	396 ,,	394 ,,
Hole in steam disc	½-in. diam.	⅝-in. diam.
Steam pressure	60 lbs.	60 lbs.
Speed of fan	2050 R.P.M.	2155 R.P.M.
Time of charging last retort	2 hrs. before test	2 hrs. before test
Clinkering	5 ,, ,,	3 ,, ,,
Fire dragged	1 ,, ,,	No dragging done

The above analyses would seem to show that in the first test there was an excess of steam, as the inerts are higher and the CO lower than in the second test, and evidently the percentage of blue water gas was lower in the first than in the second. Thus we have two gases of practically the same calorific value, but with totally different composition. The second sample was burned in an ordinary upright incandescent burner; and after enlarging the holes in the nipple and almost closing the air-ports, we obtained an excellent light and a well-filled mantle at only 1 in. pressure, the consumption of gas being only 6·1 c.ft. an hour.

From Jan. 12 to 26, daily tests gave an average of 384 B.Th.U. (gross), 5·8 p.ct. CO_2 and 29·3 p.ct. CO. In the test made on March 25, the following information was obtained:

Time.	Meter Reading.	Gas Made.	Steam Pressure.	Speed of Fan.	Calorific Value.
		C.Ft.	Lbs.		(Gross).
2.0 p.m. .	1,144,643	—	—	—	—
3.0 ,, .	1,144,722	7900	73	2050	—
4.0 ,, .	1,144,798	7600	60	2050	366
5.0 ,, .	1,144,860	6200	57	1900	—
*6.0 ,, .	1,144,870	1000	56	—	—
7.0 ,, .	1,145,934	6400	58	1786	—
8.0 ,, .	1,145,016	8200	73	2210	—
9.0 ,, .	1,145,115	9900	70	2050	321

Verticals and horizontals shut-down 1.50 p.m. Fire clinkered 12.30 p.m.
Last retort charged before test, 1.15 p.m. One retort charged, 5.10 p.m.
* Plant shut-down for charging, changing pyrometers, examination of fire, &c.
Coal in retorts . . . . . 7 cwt. each = 2 tons 16 cwt. per day.

Deducting the hour from 5 to 6 p.m., the gas made was 46,200 c.ft., or 7700 c.ft. per hour, with a quality of 344 B.Th.U. gross. On a working day of twenty hours and carbonizing 2·8 tons of coal, we get a make of 55,000 c.ft. per ton of 344 B.Th.U.—equivalent to 18,920,000 B.Th.U. per ton, or an efficiency of 63·1 p.ct. in gas alone. If we take the period from 3 p.m. to 4 p.m., we find 54,285 c.ft. per ton of 366 B.Th.U., or 19,868,310 B.Th.U. per ton, or an efficiency of 66·2 p.ct. If the last hour be taken, we get 70,715 c.ft. per ton of 321 B.Th.U.; and the result is 22,699,515 B.Th.U. per ton, or an efficiency of 75·66 p.ct. For the purpose of the above test, all the horizontal and vertical retorts were shut-off, and the mixed gas from this plant passed through the whole of the works plant.

No measurement of the tar was taken; but if we assume 12 gallons per ton with a calorific value of 15,800 B.Th.U. per lb., the above yields are increased by 2,123,520 B.Th.U.—making the total efficiencies 70·3, 73·3, and 82·6 p.ct. respectively, which are very close to the figures named in the Clerk-Smithells-Cobb report of 1919.

The full efficiency (ignoring tar) which might be expected from the usual results obtained by the two-stage process may be worked out as follows:

Coal, 1 ton	= 6,500,000 B.Th.U.
Coke (from above) 13½ cwt. = ¾ ton × 72,000 c.ft. × 300	= 14,400,000 ,,
Total	20,900,000 ,,

i.e., 69·7 p.ct. efficiency (without tar) making 360 B.Th.U. gas.

It will be observed that the full production of coke from a ton of coal is allowed for. This is because in the setting described the heating of the retorts is accomplished by the combustion of the blow gases, and thus a source of waste in many water-gas plants is eliminated, and practically the whole of the coke utilized for water-gas production. As, however, only about 10 cwt. of coke per ton is available from the ordinary retorts, the calculation for the two-stage process is thus:

Coal, 1 ton	= 6,500,000 B.Th.U.
Coke, ½ ton × 72,000 c.ft. × 300 . .	= 10,800,000 ,,
Total.	17,300,000 B.Th.U.

This is very good working indeed. A more average result would be:

Coal, 1 ton	6,250,000 B.Th.U.
Coke, ½ ton × 65,000 c.ft. × 280 B.Th.U.	9,100,000 ,,
Total.	15,350,000 B.Th.U.

i.e., a little over 50 p.ct. efficiency (ignoring tar) making 360 B.Th.U. gas.

Taking the figure given previously for the test—18,920,000 B.Th.U. per ton actually obtained—there is thus a saving of 3,570,000 B.Th.U. per ton over the ordinary two-stage process, apart from the saving in labour in handling coke and the consequent damage thereto. This has been obtained from a setting practically "home-made."

If the last figure is taken, the saving is even more marked. As 18,920,000 B.Th.U. per ton can be obtained, it will be seen that when making gas of 400 B.Th.U. a make of 47,300 c.ft. per ton would be obtainable; and similarly, when making 450 B.Th.U. gas, 42,000 c.ft. per ton. When making a low-grade gas (say) about 300 or 320 B.Th.U., a greater yield of heat units is obtained, as shown in the figures of the test. Still higher figures might be obtained by allowing producer gas to pass over; but whether this is "worth the candle" is another matter. Some people think it is. In all the tests referred to, samples were taken before the gas entered the retort-house foul mains.

The setting is at present operated by hand; but experiments are being made with automatic control, advantage being taken of the use of the single lever mechanism. This would enable us to reduce the labour by one-third, by having only two eight-hour shifts; the two four-hour intervals between shifts being worked automatically.

The setting described, being the first erected, is of course by no means perfect; but I venture to think the results sufficiently encouraging for further investigation. The waste entailed in quenching hot coke, moving it from the retort-house, and taking it to the water-gas plant to be again heated-up, has been entirely eliminated; while capital expenditure has been kept down.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Eighth Annual Dinner.

After an adjournment from last month, compelled by the threatened strike of railwaymen, the members, wives, and friends of the Association, to the number of over 120, dined together on Friday evening at Anderton's Hotel, Fleet Street, and, in the enjoyment of this function and a first-rate concert that followed it, forgot for a time the anxieties from which none can be free while the country is experiencing the disastrous effects of a prolonged coal strike. The preparation and carrying through of such a programme is a task of no mean proportions; but those upon whose shoulders the work must have mainly fallen—the President (Mr. Frank J.. Pearce, of the North Middlesex Gas Company), the Hon. Secretary (Mr. George Winslow), and the Stewards (Messrs. J. Hewett and Lloyd W. Worth)—were well rewarded by the success which attended their efforts. As for the contributors to the programme, their gratifying reception by the audience was proof of the extent to which their renderings had been appreciated. Among the guests were Mr. John Terrace (Engineer of the South Suburban Gas Company) and Mr. Stephen Lacey (Distributing Engineer, the Gas Light and Coke Company). The Loyal Toast having been duly honoured,

Mr. Terrace proposed "The Association," and, in doing so, said the time had passed when it was in any way necessary to point to the utility of the Junior Associations. One very great advantage of these organizations was the large variety of people that they embraced in their membership; and one of the most important ways in which they assisted these members was in the advancement of education. He believed that their Association, if not quite the earliest to be formed, was at any rate one of the oldest of the Junior Associations. Their record was a very good one; and during the time of difficulty in the great war they had managed to carry on, quietly but most successfully. From the enthusiasm which he found among the members, it was clear to him that the useful work of the Association showed every indication of great extension. He would like to congratulate the President on what he believed had been one of the most successful years of the Association; and he trusted it would enjoy many years of prosperity. The Association was fast approaching its manhood; but he hoped that, even when it became a grown man, it would not be ashamed to call itself a Junior Association.

Mr. F. A. Frost (the Senior Vice-President), in responding, remarked upon their indebtedness to Mr. Terrace and other seniors. As they had just been reminded, the Association was approaching manhood; and this, coupled with the fact that the membership roll was larger now than at any previous period in its history, was good testimony to the value of the work that had been done. The degree of success attained, however, had only been rendered possible by the kindness and help they had always received from the seniors in the profession; and he wished to express the thanks of the Association for all they had done, and to Mr. Terrace and Mr. Lacey for joining them that evening.

Mr. D. C. Cross proposed "The Visitors," and emphasized what had been said by Mr. Frost as to the readiness of their patrons at all times to render any help that might be in their power. The toast was acknowledged by Mr. Stephen Lacey.

Mr. S. B. Chandler, submitting "The President," read the following letter, which had been addressed to the Hon. Secretary by Mr. L. Trewby, the Engineer and General Manager of the North Middlesex Gas Company:

> I regret very much not being present at your dinner this evening, in order to add my testimony to the others to the excellency of your Association and especially of your President. Mr. Pearce has been with me for the past nine years as my Chief Assistant; and those nine years, as everyone knows, have been years of the greatest anxiety any gas undertaking could experience. He has been the greatest support to me during those years—more especially during the last twelve months. It surprises me very much that, with the great calls he has had on his time at Mill Hill during 1920, he has found time to become your President, and to put in all the time necessary to attend your meetings and visits and to carry on your Association in the efficient manner it has been done.
>
> I think that engineers are realizing every day what an important body your Association is to the gas engineering profession generally, in raising the status and improving the knowledge of the young engineer who will, before long, become one of the seniors; and I hope that engineers of undertakings will still more encourage their staff to join your Association, so that its usefulness may be still further increased along with its numbers.
>
> In conclusion I can only wish you a very pleasant evening and a greater degree, if possible, of usefulness in the future.

They all wished Mr. Pearce every success in his future career, and much appreciated him as their President. He had guided the Association well during a busy year.

The President feelingly replied to the kind things which had been said; and thereafter the toast of "The Secretary and Treasurer" was cordially drunk, at the call of Mr. W. Grogono, and responded to by Mr. G. Winslow and Mr. A. Broadbent.

The 27th James Forrest Lecture will be delivered before the Institution of Civil Engineers by Sir George T. Beilby, F.R.S., Assoc.Inst.C.E., on Tuesday, June 28.

LESSING'S CONTACT RINGS.

In a paper entitled "Fractional Distillation with Contact-Ring Still-Heads," which he presented on Monday evening of last week at a meeting of the London Section of the Society of Chemical Industry, Dr. R. Lessing pointed out the advantages of packing absorption towers and distilling columns with contact-rings of the type described in his patent No. 139,880. These rings consist of cylinders of approximately equal height and diameter, having a gap in the circumference and a more or less diametrical partition connected on one side with the cylinder, but out of touch on the opposite side. They are disposed indiscriminately in the tower or column at the angles which they find when dropped promiscuously into a vessel. Packing material of a similar kind, but consisting of plain cylinders, was patented by Raschig, and has been extensively employed; but the provision of the central partition and openings has been found very considerably to increase the efficiency of the packing, by adding to the contact surface available in a given tower space and enhancing the drainage capacity of the packing.

The author said that the standard rings of 1 in. diameter by 1 in. in height are used in a great variety of plants of the chemical and gas industries; among them being ammonia scrubbers, absorbers, washers, tar-extractors, carbolate decomposers, carbonating and decarbonating towers, debenzolizing stills, distilling columns, and still-heads for many substances—such as tar and petroleum products, alcohols and essential oils—condensers, coolers, and heat exchangers. They are applicable wherever a large interfacial surface for liquid and gas or vapour, combined with a minimum of back-pressure, is essential. There are now available smaller sizes of these rings, down to ¼ in. diameter; and these are particularly useful for the construction of laboratory still-heads on the lines on which the larger rings are applied in manufacturing operations. The main idea of the early experiments with these small rings was to reproduce as far as possible works' conditions in the laboratory; and, for this purpose, plain tube still-heads as proposed by Hempel were used, with ¼-in. contact-rings substituted for the glass beads. These beads, of course, offered very considerable resistance; usually taking up 80 p.ct. or more of the still-head space. On the other hand, the resistance of a ring-packed column is so small that still-heads of great height can be employed. Also, the surface offered by this ring packing is very large—amounting to some 251 sq. ft. per cubic foot; while the volume occupied is only about 13 p.ct. of the total space, leaving 87 p.ct. of free space for vapour and condensate.

The arrangement has the advantage of extreme simplicity, for the rings are merely dropped into plain glass tubes, and they can then be transferred from one column to another or be used in absorption towers or reaction vessels, and are, therefore, of general applicability. They have a remarkable fractionating efficiency, and are in this respect superior to other dephlegmators. This efficiency is due to the large surface per unit of volume, the turbulence created by frequent deflection of currents of vapour and condensate, and the consequent absence of channelling. In order to obtain the maximum efficiency, the author recommends the lagging or even heating of the still-head to avoid undue condensation, and the provision of a reflux condenser or the use of a definite length of the still-head itself as a reflux condenser. Thus, return flow and irrigation of the whole length is obtained. A ring-packed still-head may then be regarded as a scrubber in which the ascending vapours are scrubbed with the descending condensate. All considerations applied to the theory and practice of scrubbing or absorption towers are therefore applicable to still-heads; and their study should yield valuable results, if carried out from the scrubbing point of view. While the drainage capacity of the packing is very high, the rings necessarily retain a thin film of the liquid after draining. This point, however, acquires importance only in cases where very small quantities are fractionated, and the distillation of the last fraction is desired.

The paper was illustrated by a number of graphs demonstrating the efficiency of fractionating obtainable. From a mixture of equal portions of benzene and toluene, 40 p.ct. of benzene distilled within less than 1°, and a like portion of pure toluene was yielded, leaving only about 5 p.ct. of the total volume in the mixed middle fraction. From a crude coke-oven benzole, almost all the benzene and toluene could be distilled off each within 0·2° C., though the sample contained 30 p.ct. of naphthalene and wash oil. The effect of still-head dimensions, heat insulation, and reflux condensing was shown in one set of curves; while another chart dealt with the distillation of fusel oil. A remarkably sharp separation of the various higher alcohols from each other and from water was shown in a further graph. The fractionating effect is so sharp that chemically anhydrous alcohol may be in the lower part of the still-head, while there is sufficient water in the upper portion to separate as a distinct layer from the distillate.

At the close of the paper, a number of questions were asked. In reply to them Dr. Lessing said that, if the rings were perforated, channelling would be more likely to arise. One suggestion made was that the size of the rings might be graduated from the bottom of the still-head to the top.

Estate to the gross value of £4817 was left by the late Mr. Bertram Blount, F.I.C., F.C.S.

THERMAL LOSSES IN GAS-PRODUCERS.

The causes of thermal losses in gas-producer processes were considered by Mr. N. E. RAMBUSH in a paper which he contributed to a meeting on Monday of last week, at Burlington House, Piccadilly, of the London Section of the Society of Chemical Industry. During this part of the proceedings, Mr. E. V. Evans occupied the chair.

The author set down as the ten points to be generally regarded when estimating the anticipated thermal efficiency of the gasification of a certain fuel: Moisture content in fuel; nature of volatile matter in fuel; grading of fuel; soot formation; ash content in fuel; the radiation and convection heat losses from the producer proper to the atmosphere; gas leakage losses; losses in washing liquors; moisture content in gas; temperature of, and sensible heat contained in, the hot gas leaving the producer.

These points the author proceeded to discuss, by the aid of curves. He said that the amount of the volatile matter in the fuel which is obtained as liquor condensate and as tar should be determined by means of a retorting test. The more uneven the grading, and the larger the biggest pieces of fuel, the greater is the fuel depth required for efficient gasification. Dust and soot losses are due to high gas velocities and high temperatures. These losses may represent as much as 3 p.ct. of the heating value of the fuel. The higher the ash content in the fuel, the higher will be the percentage of carbon in the ashes. Thus the unburnt fuel loss is of the cumulative order in regard to the ash content. The radiation and convection loss from a gas-producer is in the order of 1 p.ct. of the heating value of the fuel gasified. Leakage losses due to poking, cleaning, and bad joints, may be at least 1 p.ct. of the heating value of the fuel gasified. The losses in the cooling and cleaning plant are from mechanically carried away gas, and gaseous or tarry matters dissolved in the washing liquor. Such losses may be as much as 1 p.ct. of the heating value of the fuel treated.

The greatest cause for thermal loss, Mr. Rambush went on to say, is generally that amount of heat which is carried away by the hot gases from the producer. This loss is practically absent with hot-gas producers (where the gas is not cooled); but for an average English coal, the sensible heat loss represents: Hot-gas producer (if cooled), 17 p.ct.; cold-gas producer (without recovery), 14·2 p.ct.; ordinary Mond type of bye-product producer, 16·4 p.ct.

RECOVERY OF NITRE CAKE.

Before the Manchester Section of the Society of Chemical Industry, on the 6th inst., Mr. W. H. H. NORRIS, B.A., B.Sc., F.I.C., read a paper entitled "Methods for the Complete Recovery of Nitre Cake."

The oldest method for complete recovery, he said, was by the salt-cake furnace. Expenditure on hard coke at present prices is a considerable charge; and where hydrochloric acid is the valuable product, nitre cake has little chance of competing with sulphuric acid because of the reduced yield per furnace, and the impurity of acid produced when nitre cake is employed. Many other plans have been suggested; but he does not know that any of these have been carried out on a manufacturing scale with the exception of the following: Nitre cake may be used for ammonia absorption, producing sulphate of ammonia, with the additional formation of sodium sulphate suitable for glass makers. A process was described which had been worked-out in conjunction with Messrs. H. S. Denney and C. W. Bailey, and 220 tons of nitre cake used to produce 157 tons of salt cake and 87 tons of ammonium sulphate by it. The plant was run in conjunction with a Mond gas ammonia recovery plant, and proved successful in operation. The method is of wide application, and may be used either with ammonia absorption towers and washers, or in the ordinary saturator as employed on coke-oven and gas-works liquor recovery plants. The operation works-up all its own waste liquor, and requires the minimum of handling and evaporation.

Briefly, the nitre cake is digested with hot process liquor, and the whole of its contents of salt cake are precipitated in a pure form, while all the acid is taken into solution. The mixture is filtered and washed in centrifugals, and the acid liquor resulting is used for ammonia absorption either in the saturator or other absorption plant. The neutralized liquor is evaporated in the usual way, for the deposition of sulphate of ammonia containing over 24 p.ct. free ammonia; but concentration is checked when a definite density is reached, and the process liquor is run back to the digestor to extract the acidity from a fresh charge of nitre cake.

Sheffield University Lectures on Coal.—On account of the continued unsettled state of the coal industry, and the restricted train services, it has been decided to postpone until later in the year the series of lectures on "Coal," which (as announced on p. 251 of last week's issue) had been arranged for this month by the Department of Fuel Technology of the University of Sheffield. Due notice will be given of the revised dates, which will probably be in October.

REGISTER OF PATENTS.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for May 4.]

Nos. 11,795 to 12,467.

ALDER AND MACKAY, LTD.—"Gas-regulators." No. 12,355.
BRIGGS, H.—"Valves and cocks." No. 12,246.
COMMIN, F. J.—"Treatment of pitch." No. 12,388.
CORT, W. S.—"Scrubbing and cleaning devices." No. 11,951.
FLAVELL, J. W.—"Supports for gas-rings, &c." No. 12,328.
GLOVER, T.—See Alder and Mackay. No. 12,355.
HALFORD, J.—"Gas-mantle grip." No. 12,215.
HOVENDEN, E. W.—"Fluid-meters." No. 12,135.
JOHNSON, A.—"Portable elevators or conveyors." No. 12,060.
KENT, W. G.—See Hovenden. No. 12,135.
METAL-WOODS, LTD.—See Cort. No. 11,951.
MILLS, S.—See Johnson. No. 12,060.
PARRISH, P.—"Manufacture of neutral sulphate of ammonia." No. 12,116.
ROBERTS, W.—See Briggs. No. 12,246.
SALERNI, P. M.—"Apparatus for distillation of carbonaceous materials." No. 11,838.
SARTORIS, G. U. L.—"Means for generating and utilizing gases under pressure." No. 11,841.
SAUNDERS, A. E.—"Superheated chambers of incandescent gas-burners." No, 12,160.
SCRACE, F.—"Gas-burners for incubators." No. 11,822.
SOC. DU GAZ DE PARIS.—"Manufacture of illuminating gas." No. 12,228.
SOUTH METROPOLITAN GAS COMPANY.—See Parrish. No. 12,116.
STIMSON, E. F.—"Geysers." No. 11,825.
STIMSON, E. F.—"Atmospheric gas-burners." Nos. 11,826, 11,827.
SUTHERLAND, A. G.—"Stuffiing-boxes for gas-meters, &c." No. 12,403.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

The Harrogate Gas Bill, St. Helens Corporation Bill, Colne Corporation Bill, Leicester Corporation Bill, and Burnley Corporation Bill: Brought from the Commons, read the first time and referred to the Examiners.

The Tendring Hundred Water and Gas Bill: Read the third time, passed, and sent to the Commons.

The following Lords Committee has been appointed to join with the Committee of the House of Commons to consider the Rhymney and Aber Valley Gas and Water Bill: Lord Monson, Lord Oriel, Lord Kintore, Lord Farrer.

Dundee Gas Order Confirmation Bill.

A Bill to confirm a Provisional Order relating to Dundee gas was presented by the Lord Stanmore, read the first time, and—pursuant to the Private Legislation Procedure (Scotland) Act, 1899, section 7—was deemed to have been read a second time and reported from the Committee.

HOUSE OF COMMONS.

Progress of Bills.

The Burnley Corporation Bill: As amended, considered, read the third time, and passed.

The Wandsworth, Wimbledon, and Epsom District Gas Bill: Read a second time and committed; referred to the Committee on Unopposed Bills.

The Colne Corporation Bill and Leicester Corporation Bill: Read the third time and passed.

The Cardiff Gas Bill and the Swansea Gas Bill have been added to Group D of Committees on Opposed Bills.

The Radcliffe and Little Lever Joint Gas Board Bill: Reported, with amendments [title amended].

Public Utility Companies (Capital Issues) Act, 1920.

A report was presented on an application to the Board of Trade under the Act by the Redditch Gas Company.

The Gas and Coal Industries and Co-Partnership.

Sir J. FORTESCUE-FLANNERY asked the Prime Minister whether his attention had been called to the system of co-partnership in general use in the gas industry; whether 5,000,000 tons of coal were carbonized annually under the system; whether the workmen co-partners had £1,250,000 sterling invested in the gas-works where they were employed, and if they elected workmen directors upon the respective Boards; the number of years the co-partnership system had been in operation in the gas industry and the date of the last stoppage from dispute in that industry; and whether the Government would consider the appointment of a Select Committee of the House to inquire into the possibility of applying the co-partnership system to the coal-mining industry.

The PRIME MINISTER replied that he was aware that a large number of company-owned gas undertakings were carried on under a co-partnership system. One of the schemes had been in operation for thirty years, and others for more than ten years. In two cases the employees

were represented on the Board of Directors; but he had no information as to the amount invested by workmen co-partners. The last stoppage from a dispute in the gas industry occurred in the present month, but not in an undertaking which had a co-partnership scheme. Several stoppages occurred last summer; but only one undertaking with a co-partnership scheme was then affected. In 1918, there were stoppages at a number of gas-works in the London area where co-partnership schemes were in operation. In regard to the last part of the question, he referred Sir James to the full discussion on this subject which took place on July 29 last, and in particular to the statement made by the Chancellor of the Exchequer.

Colonel NEWMAN asked whether the Government had considered the feasibility of mines being acquired and run on a co-partnership or profit-sharing basis, on lines similar to those adopted by the South Metropolitan Gas Company; the debentures in money or credit to be held by the Government on behalf of the public, and a Government representative to sit on the Board of Directors.

Mr. BRIDGEMAN (the Secretary for Mines), who replied, referred the questioner to the answer given above by the Prime Minister to Sir J. Fortescue-Flannery.

Sulphate of Ammonia Prices.

Sir A. BOSCAWEN (the Minister of Agriculture), replying to a question by Sir H. Hope), said the net cash price for sulphate of ammonia delivered to the consumers' nearest railway station or wharf in Great Britain, or in the case of sales to Ireland, the Channel Islands, or the Isle of Man, f.o.b. at British port, for delivery during the period March to May, 1921, was £24 11s. per ton, for quantities of not less than 4 tons; additional charges being authorized for quantities of less than 4 tons. The maximum selling price previously fixed by arrangement between the Ministry and the makers for deliveries during the March-May period was £27 13s. 6d. per ton; but owing to a decline in the world price of nitrogenous fertilizers, the makers agreed to reduce their prices. The Ministry were informed that sulphate of ammonia was being exported on old contracts ranging from £25 to £40 a ton. Contracts for forward delivery abroad were being made at from £16 to £18 per ton; and it was anticipated that the prices for home consumption next season would be reduced to conform to the world price of nitrogenous fertilizers.

Lighting and Fuel Restrictions During the Coal Strike.

Viscount CURZON asked the Prime Minister whether, in the event of the prolongation of the stoppage in the coal mines, he would impose all the war lighting restrictions and regulations for the early closing of all places of relaxation and entertainment forthwith; whether he would insist on the most drastic reduction of light and fuel in all Government Departments and in the Palace of Westminster; whether he would insist on the equitable sharing out of all stocks of coal, whether Government or private, whenever and wherever necessary, and, if necessary, take compulsory powers for the purpose forthwith; whether he would assure the country that such coal as the Government might consider necessary for the life of the community, whether from home or foreign sources, would be obtained, and that complete protection would be given to any volunteers who undertook to discharge or to distribute it.

Mr. BRIDGEMAN (Secretary for Mines), who replied, said: As regards war lighting restrictions, he would refer the noble Lord to the reply that he gave to him on April 21 last [see "JOURNAL," April 27, p. 205]. The questions whether regulations should be issued directing early closing of all places of relaxation and entertainment was being considered in relation to the amount of available stocks and the saving which could be effected. Urgent instructions had been issued to Government Departments by the Office of Works directing immediate economies in lighting and heating; and he understood that drastic reductions in the consumption of light and fuel had already been effected in he Palace of Westminster. With regard to the other points raised, he was satisfied that the Government possessed ample powers, and all necessary steps towards effecting the purposes indicated had been, and were being, taken.

Viscount CURZON asked whether the amount of street lighting might not be considerably reduced.

Mr. BRIDGEMAN said this was a question for the police; and it was also one of public safety. All these matters had to be taken into consideration.

Gas-Works Casual Labourers and Unemployment Benefit.

Mr. WILL THORNE asked the Minister of Labour if there were a large number of casual labourers working at gas-works who came under the Unemployment Insurance Act, who could not get any State Unemployment pay; and could some arrangement be made so that the casual labourers, when not working, could receive their unemployment benefit in accordance with the Act.

Sir M. BARLOW replied that large numbers of casual workers were drawing unemployment benefit; but he understood some difficulty was caused in this class of employment owing to the rule requiring the unemployment book to be lodged at the Employment Exchange during unemployment and to be "lifted" for each casual job so that it might be handed to the employer for stamping. In order to meet this difficulty, it had been decided, as an experiment, to issue a special book, to be called a "Casual Employment Book," to casual workers claiming benefit and likely to obtain jobs in insurable employment.

A Loss at Darwen.—Mr. G. Pickup, the Chairman of the Darwen Corporation Gas Department, announces a loss of £4263, accounted for by the increased cost of coal, which averaged 37s. 8¾d. per ton, against 27s. 3¾d. the previous year. The extra cost of coal had thus been £10,117. Carbonizing costs had increased by £2508. The additional expenses upon retort maintenance were £820. Maintenance of works cost more by £1222, due to increased wages. Management expenses had gone up £511; and rates and taxes, £1917. The total expenditure was increased by £17,618. The gas sold showed a gain of £2891, tar £2180, and coke £2627. There was a total increased revenue of £7325.

RADCLIFFE AND LITTLE LEVER JOINT GAS BOARD BILL.

This Bill again came before the Unopposed Bills Committee of the House of Commons (presided over by Mr. J. F. Hope, the Chairman of Ways and Means), last Thursday.

The Bill proposes to constitute and incorporate a Joint Board, consisting of representatives of the Radcliffe and Little Lever Urban District Councils, to which the undertaking of the Radcliffe and Pilkington Gas Company is to be transferred.

When the Bill came before the Committee on April 21—then presided over by Mr. J. H. Whitley—its consideration was postponed in order that an opportunity might be given to the Ministry of Health to submit a supplementary report. The Ministry had previously reported on the Bill; but since it was originally introduced, the circumstances had changed, as the Urban District Councils of Prestwich and Whitefield had decided not to participate in the scheme. [See "JOURNAL," April 27, p. 307.] In the circumstances, therefore, it was thought advisable to refer the Bill back to the Ministry of Health for their further report.

Mr. R. C. DODDS (Messrs. Lewin, Gregory, and Anderson, Parliamentary Agents) said that, in accordance with the decision of the Committee, he had written to the Ministry of Health, who had replied that the matter of the withdrawal of two of the proposed constituent authorities from the promotion of the Bill had been considered; and it was not desired to issue a supplementary report in consequence, or to put forward further recommendations.

Dealing with the position of the two remaining authorities, so far as the electors were concerned,

Mr. DODDS said at the meeting held under the Borough Funds Act the electors were distinctly told that, in the event of any of the other authorities withdrawing, they would continue with the promotion of the Bill, and that if there were any loss on the undertaking they would have to carry the whole burden. The question had been raised at the meeting as to whether the rates would have to bear an additional burden; but it was explained that there was very little possibility of financial failure, except in the event of a contingency not contemplated—something in the nature of a catastrophe; and there was not likely to be a call upon the rates. The authorities who had decided not to proceed further with the scheme would be in the same position as before, except that the undertaking would be in the hands of a board and not in the hands of a company.

In answer to Sir EDWARD CORNWALL,

Mr. DODDS said there had not been a meeting of the Radcliffe electors since the two constituent authorities had withdrawn; but when the meeting was held they were aware of the fact that it seemed evident the Whitefield Council would not come in. Prestwich was always considered a doubtful "starter," owing to the fact that half their area was supplied with gas by the Salford Corporation and half by the Radcliffe Company.

In reply to the CHAIRMAN,

Mr. DODDS said that the authorities who had withdrawn were content to allow the scheme to proceed. Had they objected, they could have petitioned Parliament in the matter. He presumed they did not come into the scheme because of the financial burden which might be imposed upon them.

Dr. CARR (Chairman of the Radcliffe Urban District Council) corroborated the information given with regard to the meeting of the electors of Radcliffe. Radcliffe had for some time been anxious to have the gas-works, and when the opportunity arose they as a matter of courtesy gave the adjacent authorities, whose areas were supplied by the Company, the chance to join. The Councils fully agreed with the scheme.

Mr. HUDSON (Chairman of the Finance Committee of the Radcliffe Council) thought there was no possibility of financial failure. The purchase price arranged was £230,000, although the Company had asked a good deal more than this figure.

Mr. ISAAC CARR (Engineer to the Widnes Corporation Gas and Water Works) said that the purchase was a favourable one; and had it been a compulsory purchase the price would have been considerably more than the figure agreed. He did not know of a transfer which had taken place on such very good terms. The Company's plant was equal to new; and owing to its excellent condition and the possibilities of development, it was exceedingly unlikely that there would be a demand on the rates.

Considerable discussion ensued on the question of finance; the Committee apparently holding the view that the interest on the money which would have to be borrowed to carry out the purchase would be a heavy burden. They were reluctant to accept the view that it was wise to go on with such a scheme at such a time as the present.

As to the periods for the repayment of the borrowed money, this was proposed in the original Bill to be fixed at fifty years so far as the purchase money was concerned; but in view of the Committee's remarks Mr. Dodds asked that it be reduced to forty years. Before the war, it was usually thirty-five years; but he expressed the opinion that the abnormal circumstances of the present day justified the promoters in asking for forty years.

The Committee decided, however, that it should be thirty-five years; otherwise they would be creating a precedent. The period for the repayment of the money borrowed for alteration and improvement of the works and for new mains and extensions was also reduced from thirty-five to thirty years.

The preamble of the Bill was then proved, and it was ordered to be reported for third reading.

The agreement between the Company and the local authorities of Radcliffe and Little Lever, which is scheduled in the Bill, provides that payment shall consist of (1) a sum equivalent to £21 per share in respect of the existing 3000 original shares of £10 each, at a maximum dividend of 10 p.ct. per annum, together with a sum equal to interest at 10 p.ct. per annum, less income-tax, on the nominal amount of the shares from the last payment to the date of transfer; (2) a sum equivalent to £14 14s. per share in respect of the existing

9000 new ordinary shares of £10 each at a maximum dividend of 7 p.ct. per annum, together with (3) a sum equal to 7 p.ct. less income-tax, on the nominal amount of the shares from the last payment to the date of transfer; (4) £5750 as compensation to the Directors and chief officials of the Company (the Chief Officials being the Secretary and Manager and Cashier), these Chief Officials to be taken over on the same basis as to position and emoluments by the Board, unless they are unwilling, as those under which they were employed on Feb. 1, 1920; and (5) the Board to undertake to discharge all mortgages, charges, contracts, &c., of the Company affecting the undertaking. The transfer date to be Sept. 30, 1921, or, if notice in writing be given to the Company, two months before that date, it may be postponed until Dec. 31, 1921.

The Bill provides that the Board shall consist of six members to be appointed by the Radcliffe Council, and one by the Little Lever Council—the Chairman to be appointed by the Board from among its members. The term of office of the Chairman shall be one year. The Ministry of Health has power to alter the number and proportion of members, on the application of one of the constituent authorities; and if any difference arises between the Board and one of the constituent authorities, it shall be referred to and settled by the Ministry of Health or by an arbitrator appointed by the Ministry.

As to the supply of gas, power is sought to maintain gas-works and convert residual products—the usual one-third clause obtaining. A testing-place is to be provided, at which, within six months after beginning to supply gas, the Board shall provide apparatus for testing the calorific power. The standard calorific power is to be 500 B.Th.U.; and the usual provisions with regard to the number of tests made on one day to apply. Penalties for deficiency are a maximum of £2 for a deficiency of 14 B.Th.U.; £5 between 14 and 28 B.Th.U.; and £10 for each further complete 28 B.Th.U. The pressure is fixed at 15-10ths, and a proviso has been added since the Bill was deposited that gas supplied to the Lancashire and Yorkshire Railway Company shall not be less than 20-10ths pressure in any main from which their supply is taken or in any pipe between the main and the meter with an internal diameter of 2 inches and upwards. Application may be made to the Board of Trade by any interested party after five years to reduce or increase the standard calorific value or pressure, or any subsequent period of five years; and the Board of Trade have power to do so. The maximum price is 7s. 6d. per 1000 c.ft.; but within twelve months from the passing of the Act the Board must apply to the Board of Trade for an Order to convert to the therm basis, under the Gas Regulation Act. The maximum charge for the hire of prepayment meters and fittings is 1s. 3d. per 1000 c.ft., or 1s. 6d. if the fittings include a cooking stove. The maximum charge for the hire of a prepayment meter without fittings is 10 p.ct. per annum on the cost of the meter.

Power is sought to borrow the sums required for the purchase of the undertaking, &c.; £5000 for the alteration and improvement of the gas-works; £10,000 for new mains and extensions; and £20,000 for working capital. The periods of repayment have already been referred to, except in respect of working capital, which is ten years from the date of borrowing. Temporary borrowing powers are also sought for current expenses up to an amount equal to one-third of the total amount of these expenses for the immediately preceding financial year, to be repaid out of the revenue received during the year for which it is borrowed. Provision is made for the application of revenue. The surplus, if any, is to be applied to the reduction of the price of gas or by way of division among the constituent authorities in proportion to the receipts of the Board from consumers in their respective districts—the sums so received to be carried to the credit of the respective general district funds. So much as is necessary for the carrying-on of the undertaking is to be retained by the Board. In the case of an estimated deficiency, this is to be apportioned among the constituent authorities in the same way.

Sulphate of Ammonia as a Weed Killer.

Reporting on sulphate of ammonia as a weed killer, the Experimental Station of the Rhode Island State College says that this method of reducing or eliminating weeds from lawns was developed there by a wide series of experiments extending over twenty years. All lawn grasses require, in order to grow at their best, that the soil be supplied with plenty of plant food in the three elements found in commercial fertilizers—nitrogen, phosphorus, and potassium. Most grasses and weeds also require that the soil be not sour; but some kinds which make an even turf grow well in an acid soil. The usual fertilizers employed for top-dressing lawns in the spring do not develop acidity, and permit the coarsely-growing weeds to crowd-out the grass. Nitrogen is commonly furnished in nitrate of soda, which tends towards an alkaline reaction. By substituting a similar amount of sulphate of ammonia, which is not more expensive, an acid condition of the soil is gradually produced which weakens the weeds, while not affecting the special grasses referred to—Bent Grasses or Fescues. Thus in two or three seasons the weeds will entirely disappear, or in new lawns will never become troublesome. The phosphorus can be applied in acid phosphate, and the potash in muriate of potash, as usual. Different soils require different amounts of plant food; but a good proportion for average conditions is 250 lbs. of sulphate of ammonia, 400 lbs. of acid phosphate, and 250 lbs. of muriate of potash to the acre. A smaller quantity than this should be used on newly-seeded lawns. A too heavy application of sulphate of ammonia will injure the grass as well as the weeds; but in the proportions noted it may safely be used as freely as the common lawn fertilizers. It is necessary that the fertilizer be distributed evenly, when the lawn is dry, in order not to burn the grass; and where convenient it is well to sprinkle the lawn thoroughly after applying the fertilizer.

Herts. Benzole Company, Ltd.—At a recent meeting of creditors of the Herts. Benzole Company, Ltd., of Hemel Hempstead, the Liquidator stated that the liabilities amounted in round figures to about £2600, due to unsecured creditors; while the chief asset was the plant and machinery, which stood in the books at £4900.

MISCELLANEOUS NEWS.

THERM BASIS OF CHARGE IN LONDON.

Reporting to the London County Council upon the Gas Regulation Act Orders issued by the Board of Trade to the Gas Light and Coke, Commercial, and Brentford Gas Companies, the Public Control Committee give the following statement showing the standard prices per therm claimed by the three Companies, the reductions suggested by the Council, and the prices fixed by the Board of Trade Orders:

	Commercial Gas Company.	Gas Light and Coke Company.	Brentford Gas Company.
	d.	d.	d.
STANDARD PRICE PER THERM—			
Price claimed by Company	15·66 (say, 15·6)	15·62 (say, 15·6)	19·01 (say, 19·0)
Reductions which the Council considered should be made from above figures—			
(a) In respect of use of figures for one year (1913-14) instead of three years (1911-12 to 1913-14)	·33	·22	·27
(b) In respect of use of standard calorific value as fixed by the Companies' Acts instead of "penalty" standard .	.. ——·33	·56 ——·78	·67 ——·94
Companies' claim less proposed reductions. . .	15·33	14·84	18·07
Standard price fixed by Board of Trade Order .	15·40	15·20	17 80
Date of commencement of Order	April 1, 1921	March 24, 1921	March 31, 1921

Each of the Companies is subject to a sliding-scale fixing the relation between the price of gas and the dividend payable; and the Orders provide for the substitution in such scales of one-fifth of 1d. per therm for 1d. per 1000 c.ft.

The Metropolis Gas (Prepayment Meter) Act, 1900, provides that the charge for the hire of any prepayment meter and fittings shall be according to the quantity of gas supplied, and that the maximum sum to be so charged shall be at the rate of 10d. per 1000 c.ft. The Orders referred to above in respect of the Commercial Gas Company and the Gas Light and Coke Company provide for the substitution of 2d. per therm for 10d. per 1000 c.ft. The Act of 1900 does not apply to the Brentford Gas Company.

Notices have been issued by the Commercial Gas and Gas Light and Coke Companies stating the prices which they propose to charge for gas in the immediate future—viz., 13·8d. and 14d. per therm respectively. Special readings of meters are proposed to be taken—and the new prices will be charged for part of the current quarter.

With gas at 13·8d. per therm, the Commercial Gas Company will be authorized to pay dividends on their 4 p.ct. stock at the rate of £5 1s. 4d. p.ct. a year, as compared with £5 9s. 4d. authorized and paid for the year to June 30, 1914.

With gas at 14d. per therm, the Gas Light and Coke Company will be authorized to declare a dividend, before deducting the statutory payment to the redemption fund, at the rate of £4 16s. p.ct. a year. The corresponding figure for the year ended June 30, 1914, was £5 1s. 4d. p.ct.

The Brentford Gas Company have also announced the price which they propose to charge as from the next reading of meters after April 1, 1921—namely, 14 6d. per therm. With gas at this price, the Company's authorized dividends will be £5 12s. p.ct. on the "A" stock and £5 10s. p.ct. on the "B" stock. These dividends are the same as those paid in the year ended June 30, 1914.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" of applications by gas undertakings to the Board of Trade for Orders under the Gas Regulation Act.

Bawtry and District Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 4s. 7d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 7·4d. per therm.

Berkhampstead Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 4s. 7d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 8·5d. per therm.

Bournemouth Gas and Water Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 4s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 17·81d. per therm.

The Company also ask for the modification of any provisions whereby the rate of dividend payable, or any other payment, is dependent on the price of gas supplied.

Brentwood Gas Company.

The standard prices now authorized in respect of the supply of gas by the undertakers are 4s. per 1000 c.ft. within a radius of 1½ miles

from their existing gas-works, and 4s. 3d. per 1000 c.ft. beyond that radius; and the prices which they have asked the Board of Trade to substitute for these are 19·5d. and 20d. per therm respectively.

Dunstable Gas and Water Company.

The maximum prices now authorized in respect of the supply of gas by the undertakers are 4s. 2d. per 1000 c.ft. for gas supplied to ordinary consumers within the borough of Dunstable, and 5s. 6d. per 1000 c.ft. for gas supplied to ordinary consumers elsewhere within the limits of supply, and 3s. 4d. per 1000 c.ft., or the lowest price for the time being charged by the undertakers for gas supplied to any private consumer, for gas to private lamps within 50 yards of the mains. The prices which the undertakers have asked the Board of Trade to substitute for these prices are 19d. per therm for gas supplied within the borough and 20·5d. elsewhere within the limits of supply, and 17d. per therm, or the lowest price for the time being charged for gas supplied to any private consumer, for gas to the public lamps.

Faversham Gas Company.

The standard prices now authorized in respect of the supply of gas by the undertakers are 3s. 11d. and 4s. 5d. per 1000 c.ft.; and the prices they have asked the Board of Trade to substitute for these are 1s. 8d. and 1s. 9d. per therm.

Felixstowe Gas Light Company.

The standard price now authorized in respect of the supply of gas is 4s. 4d. per 1000 c.ft., provided also that the undertakers may charge in that part of the limits of the Felixstowe Gas Act, 1904, which is outside the urban district of Felixstowe and Walton a price not more than 1s. per 1000 c.ft. of gas in excess of the price for the time being charged in the urban district; and the prices which the undertakers have asked the Board of Trade to substitute for these are 1s. 9·5d. per therm and 2·67d. per therm respectively.

Oakengates and St. George's Gas and Water Company, Ltd.

The maximum price now authorized in respect of the supply of gas by the undertakers is 6s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 10·4d. per therm.

Whitwell and District Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 4s. per 1000 c.ft; and the price they have asked the Board of Trade to substitute for this is 1s. 6d. per therm.

Woking District Gas Company.

The standard price now authorized for gas supplied within the parishes of Woking, Horsell, Send and Ripley, Pyrford, and within so much of the parish of Byfleet as is within the limits of supply (herein called the "inner area"), is 4s. 6d. per 1000 c.ft., and for gas supplied elsewhere within the limits of supply (called the "outer area") a price not at any time exceeding the price for the time being charged in the inner area by more than 6d. per 1000 c.ft. But the undertakers may at any time charge in any part or parts of the outer area a price or prices lower than the prices charged in any other part or parts of the outer area, but so that such lower price or prices shall not be less than the price for the time being charged within the inner area. The standard price which the undertakers have asked the Board of Trade to substitute for this price is 1s. 9½d. per therm for gas supplied by them in the inner area, and for gas supplied in the outer area a price not at any time exceeding the price for the time being charged in the inner area by more than 1½d. per therm. But they may at any time charge in any part or parts of the outer area a price or prices lower than the price or prices charged in any other part or parts of the outer area, but so that such lower price or prices shall not be less than the price for the time being charged within the inner area.

SPECIAL ORDERS.

North Middlesex Gas Company.

The Company have applied for a Special Order to increase their borrowing powers, to authorize profit-sharing schemes, and the issue of shares or stock therefor, to make new provisions as to meetings, &c.

Spenborough Urban District Council.

Notice is given of an application by the Council to the Board of Trade by the Council for an Order to enable them to acquire the undertakings of the Heckmondwike and Liversedge Gas Company and the Gomersal Gas Company, to charge for thermal units, to borrow money, and for other purposes.

DECLARATIONS OF CALORIFIC POWER.

Corbridge Gas Company.—550 B.Th.U. (June 1).

Falmouth Gas Company.—460 B.Th.U. (June 24).

Hexham Gas Company.—450 B.Th.U. (June 1).

Newcastle-upon-Tyne and Gateshead Gas Company.—475 B.Th.U. (May 2).

Sheringham Gas and Water Company.—500 B.Th.U. (June 25).

Torquay Gas Company.—480 B.Th.U. (June 1).

Paisley Provisional Order Application.—An official inquiry has been held at Paisley in connection with the application for a Provisional Order to enable the Town Council to borrow £100,000 for the gas undertaking. The Town Clerk stated that the present plant at the gas-works was quite inadequate to supply the wants of Paisley; and it was proposed to erect new vertical retorts.

Worcester and Dual Supplies.—The Worcester City Council have rejected a proposal to supply electricity as well as gas to one of their housing sites; the opposition being on the score of the existing financial position. Correspondence, it seems, is passing between the Committee and the Ministry with reference to the payment of the costs of gas and electricity mains already arranged for.

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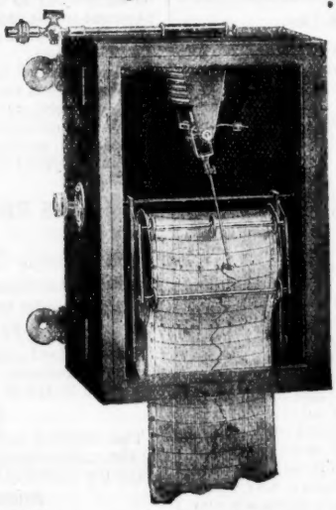

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Highest Range: 0-300 lbs. per sq. inch.

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CITY AND GUILDS OF LONDON EXAMINATIONS.

Gas Supply.

There are given below the questions put by Mr. H. Kendrick, of Stretford, to candidates last Saturday in the "Gas Supply" examinations of the City and Guilds of London Institute. The maximum number of marks obtainable is appended to each question.

GRADE I.

1. Sketch, with full dimensions, an open socket and turned-and-bored socket for a 6-in. diameter cast-iron main. Which, in your opinion, is the best type of socket for general use? Would you suggest any other type of joint or pipe for specially bad ground, either acidiferous or peaty? State your reasons. (35.)

2. Sketch and describe your methods of inserting a branch in a live main and making provision for keeping-up the supply to consumers beyond the point of insertion with and without under-pressure apparatus. (30.)

3. What are the advantages and disadvantages of wet and dry consumers' meters? Which do you prefer, and why? Which are the most expensive in first and final cost, over a period of twenty years? (35.)

4. Why is it necessary to test consumers' meters regularly? Would you test at full capacity or minimum consumption, or at both? State your reasons. (35.)

5. Give capacities in cubic feet per hour of pipes for internal work from ¾ in. to 1¼ in. internal diameter, stating limit of length for each size. (35.)

6. Why is it desirable that gas undertakings should inaugurate a maintenance system for incandescent gas-burners? What are the principal faults that have to be dealt with? (30.)

7. What are the efficiencies in candles per cubic foot for 450 B.Th.U. gas when consumed in Bray's special burners, "C" upright, and inverted incandescent gas-burners? (40.)

8. Sketch and describe a wind-proof outside lantern, fitted with superheater, and capable of developing a light of 240 candles. (30.)

9. Sketch and describe a water-heater for household purposes and show arrangements of flow and return pipes and cisterns so as to give a quick supply of hot water. (35.)

10. Sketch and describe a recuperative gas-furnace that can be utilized for forging small steel tools. (30.)

11. Unaccounted-for gas is frequently described as leakage. Is this correct? What factors go to make up the loss, real or apparent, between the gas as registered by the station meters and that paid for by the consumers. (40.)

FINAL.

1. New regulations have been issued by the Ministry of Transport for preventing fusion or injurious electrolytic action on gas-pipes. In what way do these differ from those originally in force, and what advantages do they give to the gas undertakings when compared with the old regulations? (40.)

2. A gas undertaking has an isolated industrial area [see plan]. It was necessary to increase the supply of gas to this area immediately. The original supply was a 12-in. low-pressure main entering at one end, afterwards dividing into three nearly parallel 8-in. mains. The consumption is 90 p.ct. industrial and 80 p.ct. during ordinary working hours. The demand was met by putting down a new supply system for 80,000 c.ft. per hour. What, in your opinion, would have been the most economical system to adopt? State your reasons. Give sizes of pipes and all other accessories necessary to ensure a perfect supply and unnecessary working of plant. Give a rough estimate of costs for two rival systems. (45.)

3. Describe and sketch in detail a gas-engine driven Keith compressor set for 80 in. high-pressure supply of 2000 c.ft. per hour. Upon what facts and theories do you rely when you state that the illuminating effect of high-pressure gas lighting is superior to all other types? (30.)

4. A gas undertaking supplying 550 B.Th.U. gas decided to reduce its standard to 450 B.Th.U., and carried out the reduction in four stages of 25 B.Th.U. each. Describe the effect on the consumers' apparatus in each stage. What alterations (if any) will be necessary to the apparatus to ensure best results? Discuss the principles underlying your statements. (40.)

5. A complaint is received of oscillating lights over a large area. Investigations showed that it was due to the working of a gas-engine situated some distance away from the large main. Describe fully your method of investigation proving the foregoing, and state how you would propose to remedy the trouble, which may be due to one or both of two causes. (30.)

6. A tool workshop is 120 ft. long by 40 ft. wide, with machines in four parallel lines down the length of same, with the necessary walking space between each. How would you arrange an efficient lighting system? What candle-power lamp would you use; and what system of distance lighting would you recommend? Illustrate your answer with a sketch showing position and sizes of pipe-lines, and arrangement of wiring and pushes. Give a detailed sketch of the controller you would recommend. (35.)

7. Exhaustive experiments have proved that the air of a gas-lighted room is just as pure as the air in an electrically lighted room. Detail some recent experiments which prove this statement. Do human exhalations have more or less effect on the purity of the air of a room than the products of combustion? Give reasons and figures proving your answer. (35.)

8. Describe and sketch the more important methods of ventilating large halls and rooms in dwelling-houses. Which are the most efficient, and why? (30.)

9. Describe and sketch in detail two systems in general use for lighting street-lamps by a pressure wave. What are the advantages

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and disadvantages of both? Which is most suitable for a flat and a hilly district, and why? (30.)

10. Draw a section through a gas-furnace for fine metal melting. What are the relative advantages of same compared with a solid-fuel furnace? With gas at 4s. per 1000 c.ft. and coke at 2s. per cwt., what are the costs for fuel per 100 lbs. for melting gun metal in a 60 lb. crucible in both types of furnace? (45.)

11. Describe in detail, with sketches of apparatus, the "Leeds" method of testing gas-fires for efficiency. (30.)

EXAMINATIONS IN GAS-FITTING.

Question Papers of the City and Guilds of London Institute.

The following are the questions which were set by Mr. R. J. Rogers, of Birmingham, in the recent examinations in "Gas-Fitting." The maximum number of marks obtainable is affixed to each question.

FINAL EXAMINATION.

Written Paper.

[Not more than six questions to be attempted.]

1. Explain in detail the specification for the carcassing with gas-supply pipes of an artisan's dwelling containing living-room, parlour, combined kitchen and scullery, three bedrooms, and bath-room. Provision is to be made for gas lighting in all rooms; for gas-fires in parlour and two bedrooms; for gas-cooker and wash-boiler in kitchen-scullery. State size of service-pipe, meter, and supply-pipe to lighting and heating points, and also the consumption of gas in each room. (60.)

2. You are sent with another fitter to attend to an escape of gas from a meter in a dark cellar. On arrival, you find a very strong smell of gas at the entrance to the cellar. State exactly how you would proceed to locate and stop the leakage. In the event of your comrade being "gassed" during the operations, what steps would you take to bring about his recovery? (40.)

3. An accompanying sketch shows a cylinder-tank system of hot water supply. Explain how you would convert the installation to a cylinder system suitable for heating with a gas-heated boiler as an auxiliary to the coal-heated boiler. State the consumption of gas per hour of the gas-boiler you would fix, and the approximate time required to obtain a bath of 12 gallons of water at 110° Fahr. (50.)

4. A complaint is received that the heat in a gas-cooker oven cannot be depended upon. One day it will be quite good and cook food in a reasonable time, while the next day the cooking is not done properly in a much longer period. The gas supply is good; the cooker is packed and enamel lined; and there is a flue-pipe connected to the kitchen chimney. What is the fault, and how would you remedy it? (40.)

5. A supply of gas is required for a 120 B.H.P. gas-engine. State size of (*a*) service, (*b*) meter, (*c*) outlet-pipe that you would fix, giving your method of calculation in each case. Explain by means of a sketch any type of apparatus with which you are familiar for preventing the oscillation of gas on the gas-engine supply. (40.)

6. A gas undertaking supplying gas at 500 B.Th.U. decides to reduce the quality of gas supplied to consumers to 430 B.Th.U. Explain in detail the effect that such a change would have on the following apparatus, and describe the steps you would take to ensure the maximum efficiency being obtained in each case: (*a*) Flat-flame burner, (*b*) incandescent upright and inverted burners, (*c*) gas-cooker, (*d*) gas-fire, (*e*) gas-engine, (*f*) natural-draught gas-furnace. What is the calorific value of the gas supplied by the gas undertaking in your district? (60.)

7. Describe the portion of gas apparatus to which the section shown on an accompanying sketch refers. State precisely how it works. (40.)

8. A rotary gas-compressor having a capacity of 500 c.ft. per hour with a delivery pressure of 4 in. mercury column is to be fixed complete; the drive is to be by belt to adjacent shafting. State step by step how you would proceed to fix the compressor, giving the sizes of pipe you would use, and describing the necessary details to be observed to ensure a satisfactory delivery of gas at the above pressure. (50.)

9. State the consumption of gas per hour required by a geyser supplying 2 gallons of water per minute at a temperature of 110° Fahr., and the size of pipe that you would run to the geyser. Explain by means of a sketch how you would fix the flue-pipe from the geyser so as to ensure that no down-draught took place on the burners. (40.)

PRACTICAL TESTS.

[Candidates must attempt all questions.]

The following materials to be supplied to each candidate for Tests 1 and 3:

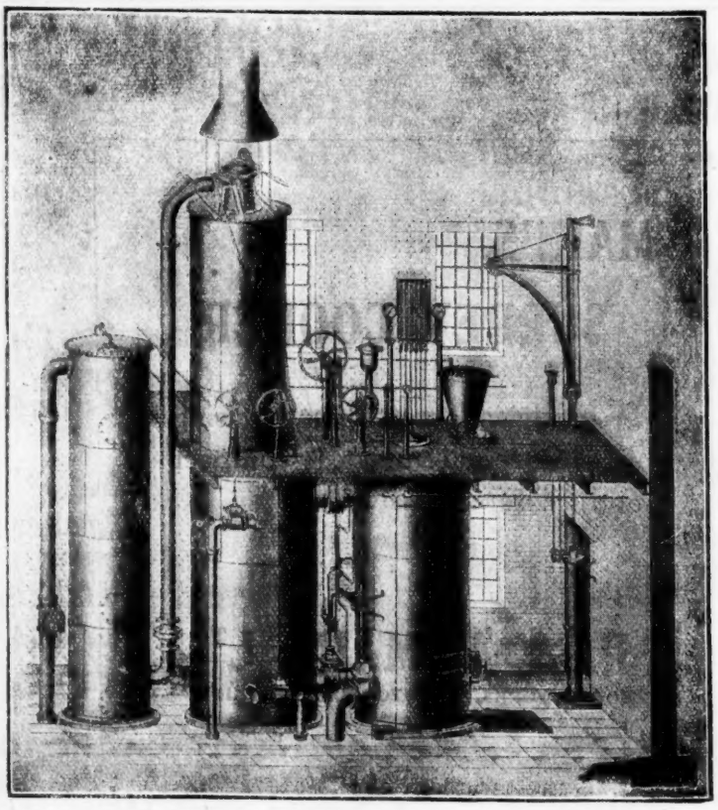
One 2-ft. 9-in. length of $\frac{5}{8}$-in. compo or lead pipe; one $\frac{3}{4}$-in. main cock and union; two 5-lt. meter unions; one $\frac{3}{4}$-in. tinned union; one 3-ft. length $\frac{1}{4}$-in. wrought-iron barrel; one $\frac{1}{4}$-in. nosepiece; one 3-ft. length of light chain; two S hooks and two rings; one $\frac{1}{4}$-in. ball joint; one $\frac{1}{4}$-in. lever cock.

1. Prepare and fix $\frac{5}{8}$-in. lead or compo connections for the 5-lt. dry prepayment meter. The service and outlet pipes are already laid to the meter cupboard in the positions shown in an accompanying sketch. (25 marks; 1½ hours.)

2. Examine the geyser and explain its construction and working. State the size of gas-supply pipe you would run to it, and explain precisely what you would do to remove the products of combustion from the room if there were no chimney flue. (25 marks; ¾ hour.)

3 Make up a $\frac{1}{4}$-in. wrought-iron inverted pendant, the overall length of which is to be 3 ft. 2½ in. The pendant is to be made complete with ball joint, lever cock, and chains, and ready for the fitting of an inverted burner. (25 marks; 1 hour.)

4. Examine the 5-lt. automatic meter. Explain its working, the



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method of registration, and the construction and working of the prepayment mechanism. Explain why prepayment meters sometimes pass gas without requiring a coin to be inserted in the slot. (25 marks; ¼ hour.)

5. Fix the portable pressure register to the gas supply, and from the record obtained from the chart state the pressure of gas. Explain precisely the precautions to be taken to ensure accurate registration of the pressure. (25 marks; ½ hour.)

6. Take to pieces and overhaul the inverted incandescent burner, and refix it to give the most efficient lighting results. State the amount of gas that you estimate to be consumed by the burner and the candle power obtained from it. (25 marks; ¼ hour.)

A *viva voce* examination on other subjects connected with gas-fitting was conducted during the progress of the above examination.

Buying Coal in Small Quantities.

At the West Riding Police Court, at Wakefield, last week, William Rose and Thomas Flynn, miners, were fined £5 each, or a month's imprisonment, for stealing 4 tons of coal from the colliery sidings of Messrs. Pope and Pearson, Altofts. They had been seen by two policemen to be taking coal away from trucks in the sidings, and loading up a motor wagon belonging to the Normanton Gas Company. It transpired that they were selling the coal to the Gas Company. Asked by the Bench why the Company had purchased coal from these men, Mr. E. H. Hudson (the Manager) said the works had become very short of coal; and rather than plunge the town into darkness, they had been purchasing small quantities—sometimes even a few hundredweight—from persons who had had permission to pick from the various slack heaps in the district. He had been assured by these men that the coal was got honestly, and by permission, as was customary in the case of many slack heaps, the stuff coming from a dump which had been there since before the war; that the coal was covered with refuse; and that the men had to riddle it. Being assured that everything was all right, he said he would accept two or three loads, but no more. After fining the defendants, the Chairman of the Magistrates, having consulted with his colleagues, said the Bench were of opinion that the Gas Company ought to have exercised more care in their purchase of coal. Mr. Hudson remarked that 60 p.ct. of the stuff purchased in this way was dust; but where they were convinced that the stuff was obtained honestly, they had been prepared to buy even such poor stuff, if it would keep the town lighted. Immediately they heard of this trouble, they stopped all such purchases.

The Dalton-in-Furness Gas Committee have decided to assist consumers in the present difficult times, both as regards general taxation and the fuel shortage, by reducing the price of gas by 5d. per 1000 c.ft. —from 6s. 3d. to 5s. 10d. The reduction will operate as from the beginning of April.

TRADE NOTES.

[For "Journal" Advertisers.]

"A. & M." Automatic Lighting.

The City of Edinburgh have decided to extend the "A. & M." patent pressure-wave automatic lighting to the public lamps in Corstorphine, Slateford, Colinton, and Juniper Green—to be in readiness for the beginning of next lighting season. The districts mentioned recently came under Greater Edinburgh, through the amalgamation. The extension necessitates a further 484 controllers.

Preventing Back-Firing in Atmospheric Burners.

Messrs. H. Pember and Son, of No. 16, Hunter's Road, Birmingham, are supplying a simple device for preventing back-firing in atmospheric burners. The regulator, which has considerable flexibility, is held by a tab, and is readily slipped into the under air-slot or open end of a burner. The gas is then turned full on, and the burner lighted; and any adjustment necessary to get a good flame is carried out by raising or depressing the tongue of the regulator. The tongue, by breaking-up the flow and checking induction, brings about a more perfect and a richer mixture, and prevents back-firing. The regulator is made in three sizes to suit burners of ½ in., ¾ in., and 1 in. bore, and can be applied to stoves, fires, rings, &c.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *May* 9.

The London tar products market is still very quiet owing to the present labour troubles—prices being purely nominal. Creonote is quoted at 9½d. per gallon in bulk, *ex* producers' works. Pure benzole and toluol is from 3s. to 3s. 3d. per gallon, and solvent naphtha about 2s. 9d. per gallon. In pitch, there are several inquiries for export, but no business has been reported.

Sulphate of ammonia is unaltered.

Tar Products in the Provinces.

May 9.

The average values for gas-works products during the week were: Gas-works coal tar, 49s. to 54s. Pitch, East Coast, 60s. to 62s. 6d.; West Coast—Manchester, 57s. 6d. to 60s.; Liverpool, 57s. 6d. to 60s.; Clyde, 60s. to 62s. 6d. Benzole 90 p.ct. North, 2s. 10d. to 3s.; crude 65 p.ct. at 120° C., 2s. 3d. to 2s. 5d. naked at makers' works; 50-90 p.ct. naked, North, 2s. 11d. to 3s. 1d. Toluol, naked, North, 3s. to 3s. 1½d. nominal. Coal tar crude naphtha in bulk, North, 11½d. to 1s. Solvent naphtha, naked, North, 2s. 3d. to 2s. 4d.

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FROM A MARKET CORRESPONDENT.

Tar Products.

The demand for tar products continues poor, although the decrease of stocks, consequent on the restriction in supplies owing to the coal strike, is having its effect slowly. In one or two directions a firmer tendency is to be noted, although no rise in prices has yet been recorded. Pitch is in improving demand for prompt delivery; and the lowest quotations are approximately between 60s. and 75s. per ton. Naphthalenes are inactive, and crudes remain £8 to £12; while refined is worth £18 to £22. Cresylic acid is very flat, and carbolic acid almost unsaleable; prices being nominally as last quoted. The demand for solvent naphtha is poor; but supplies for immediate delivery are becoming scarce, and the price is about 2s. per gallon on rail. Creosote is worth 8d. a gallon, and solvent naphtha 2s. 3d. Intermediate products are without change. Salicylic acid remains in good request at 1s. 3d. per lb. for technical grade, and aniline oil and salts 1s. 8d. and 1s. 10d. respectively. Resorcin, technical grade, is 8s. per lb.; pure, 9s. per lb.

Sulphate of Ammonia.

Trade is very quiet, and most interest centred around the future course of prices. In some quarters there is an idea that the price may come down by £10 per ton as soon as the market is free; but it is just as well to point out that there are too many factors still prevailing which will keep the price well above pre-war figures for some time to come. Production is, of course, being badly affected by the coal strike; but coming at a time of reduced consumption it is perhaps not such a drawback as it may at first seem. The cost of living, it is true, may fall; and this should assist reduction in the cost of production. Materials, except coal, may rule a little cheaper; but at the moment no large saving seems possible. It is quite likely, however, that after the end of May prices may be fixed on a level more in sympathy with the requirements of agriculturists; but it is doubtful whether they will be entirely satisfied unless the fall is a really substantial one—and such a fall it is difficult to anticipate.

At a meeting of the Blackpool Town Council on the 3rd inst., the resolution of the Gas Committee that the salary of the Gas Engineer and Manager (Mr. William Chew) be increased from £600 to £850 per annum was passed.

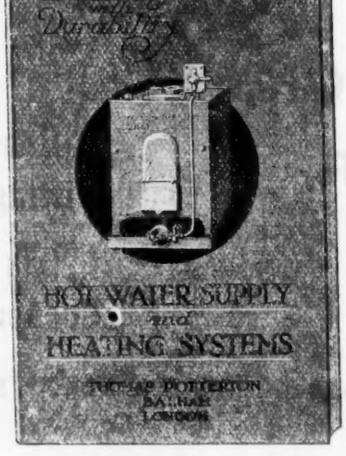
An Explanation at South Shields.

The South Shields Corporation Parliamentary Committee have received a letter from the South Shields Gas Company (in reply to the Town Clerk's request for an explanation for the recent increase in the price of gas from 2s. 6d. to 5s. 6d. per 1000 c.ft.), stating that the increase is entirely due to the higher cost of coals, materials, and wages, and also to the greatly reduced values at present being obtained for residual products as compared with a year ago. During the first nine months of last year, the Company were fortunate in being able to export abroad large quantities of coke at very enhanced prices, which enabled them to sell gas at the pre-war price of 2s. 8d. per 1000 c.ft. during the period from June, 1920, to March, 1921. Export orders for coke being now very scarce, and the prices received for such orders as the Company have been able to obtain having fallen to a fraction of the prices received a year ago, the Company had no alternative but to raise the price of gas to replace the loss of revenue from this source, in order to meet the increased working costs of the undertaking. Coal costs the Company 178 p.ct. more than the pre-war cost, and wages have increased approximately 170 p.ct. The present price of gas is equivalent to an increase of 120 p.ct. above the pre-war figure.

Nottingham Gas Profits.

At their last meeting, the Nottingham Corporation were driven to the necessity of increasing the district rate by 4d. in the pound, raising the local demand *plus* an additional 2d. on the poor-law side of expenditure to a total of 16s. 8d.—an increase of 6d. upon last year. But without the £30,000 which has been again promised from potential gas profits, it is not difficult to calculate what the additional call might have been upon the basis of the computation that a penny rate upon the City's rateable value of £1,336,850 will yield only £3540. Apart from the inability of the electricity department to furnish help in the alleviation of local burdens, the Tramways Committee, which last year handed over £24,000, can give nothing. From one point of view alone relative to gas emoluments, the situation is sufficiently encouraging; but judging from many local utterances, it does not apparently add to the satisfaction of gas consumers to know that they alone are being made use of as added contributors to the municipal exchequer. This will make the fifth year in succession in which profits have been annexed to the extent of £30,000 annually in relief of rates. A sum of £35,000 was taken for a similar purpose in 1916, and £39,000 in each of the four preceding years; while help was afforded to the extent of £32,000 in 1911. So that, totalling the amounts from the latter period only (for there was a continuity of substantial contributions before that time), it will be seen that in the eleven years, including the promised forthcoming amount, no less than £334,000 will have been contributed to the municipal coffers—an acceptable solatium (remarks a correspondent) during a time of continuously increasing burdens, but scarcely equitable in its incidence.

WATER HEATING



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Tradesman Fined for Unnecessary Light.—At the Old Street Police Court, Myer Joseph, of Bethnal Green, was fined £8 and £2 costs for using certain lights inside his shop window for the purposes of display, contrary to the Coal (Emergency) Directions, 1921. It was stated that, when requested to reduce his window lighting, the defendant told the Assistant Fuel Officer that it was his shop, and that he should do as he liked.

Dublin Public Lighting Suspended.—The Dublin Corporation Public Lighting Committee have had under consideration the question of public lighting. It was pointed out that, with the advance of summer, the periods of darkness were gradually diminished, and that consequently less necessity arose for public lighting. Ultimately, the Committee decided that, as from Monday of this week to Sept. 30, the whole of the city lighting should be shut-down—subject, however, to instruction that, should the curfew hour under military regulation be altered, due attention is to given to the lighting in the new circumstances.

Gas Manager's Salary at Stockton.—The Gas Committee recommended to the Stockton-on-Tees Town Council that the salary of the Gas Manager (Mr. W. W. Attley) should be increased from £750 to £900 per annum; and the matter was considered at a meeting of the Corporation on the 3rd inst. One reason given for the advance was the very considerable amount of work which had been done departmentally in connection with the installation of new plant, and the saving that was being effected consequent upon the work being so carried out. Mr. Kelsall, who moved an amendment that the recommendation should be referred back, contended that the present was not a time for increasing salaries. He expressed appreciation of the Engineer's work, departmentally, and hoped that the time was coming when all work would be done in this way. Mr. M'Naughton, in reply, said Mr. Attley was carrying out work worth £75,000 with his own department, and the saving to the Corporation was about £7000. The amendment was rejected by eighteen votes to nine, and the recommendation was adopted.

STOCK MARKET REPORT.

THE Stock Exchange has had another working week of only four days—being closed as usual the first day in May. Business was quiet, and the tone variable; a dull fit coming over the markets from time to time. However, before the close there were signs of an improved feeling in regard to the labour question and other crucial national problems.

In the gilt-edged market, Home Government issues were unsteady until Friday, when they made advances, but not all fully recouped their losses. As in the previous week, Consols and War Loan were losers, and Funding and Victory gainers. Final figures were: Consols 46⅝-47, War Loan 87⅝-87 11/16, Funding 71 1/16-71 1/8, Victory 79 3/16-79 5/16. Corporation loans were firm, and Indian advanced. Home Rails were in better case, and Canadians did well.

In the Foreign Market were some good points, French, Italian, and Belgian being in demand; but elsewhere there was pronounced weakness.

In the Miscellaneous Market, Rubber was very dull; but Oils, profiting by the coal shortage, had a good time. The rest were not particularly noticeable, excepting Breweries, which began to revive.

Business in the Gas Market fell away considerably in point of volume, even when allowance is made for the shortness of the week; and some of the larger undertakings were almost in a state of torpidity. However, the tone did not suffer, for all changes in quotation were in the upward direction. The London Companies were very firm, and Gas Light ordinary, maximum, and debenture rose 1 each. In Suburban and Provincial, Brentford "A" and "B" made large advances, South Suburban debentures rose 5, and British and Southampton gained 1 each. In Imperial Continental, "exceptional" bargains at all sorts of prices were marked; but the quotation 148-153 was undisturbed.

Bargains done for cash during the week were as follows: On Tuesday, Gas Light ordinary 53, 53⅜, 54, ditto maximum 42, ditto debenture 49, Imperial Continental 148, 150, 151 (and exceptional 100, 125, 137½, 143¾, 156¼), Monte Video 64, Primitiva preference 27s. 6d., South Metropolitan 64. On Wednesday, Gas Light ordinary 53⅜, 54½, ditto maximum 42½, Imperial Continental 148, 149 (and exceptional 143⅜, 150), San Paulo preference 5½, ditto debenture 35, Bournemouth 3 p.ct. debenture 43⅜, 44, 44⅛, Northampton 5 p.ct. 63½. On Thursday, Bournemouth "B" 8⅝, Brentford "A" 53½, 54, British 22, 23, 23½, Commercial 3½ p.ct. 46, Croydon "B" and "C" 100, 101, Gas Light ordinary 53¼, 54⅛, 54⅜, ditto preference 57, ditto debenture 49¼, Hornsey 7 p.ct. 74½, Imperial Continental 149½, 150, Newcastle 57⅜, Primitiva debenture (1911) 38, South Metropolitan 63⅜, 64, 64⅛, 65⅛, South Suburban 57, Tottenham "A" 58, ditto "B" 52, Wimbledon 45, Hornsey 10 p.ct. "A" 99½, ditto 5 p.ct. preference 55, Woking District 7½ p.ct. debenture 100. On Friday, European 7⅛, Gas Light ordinary 54, ditto preference 58¼, ditto debenture 49¼, Imperial Continental 148, 149, 149½, 150 (and exceptional 125, 131¼, 137½), Lea Bridge 58⅛, Tottenham "B" 53.

In the Money Market, the position was quite comfortable, actuated by the reduced demands consequent upon trade stagnation and by a superabundant supply. Discount terms were similarly affected. Silver was changeable from day to day, closing at 35⅛d. The Bank rate is 6½ p.ct., as fixed on April 28.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Mar. 11	4	4%	Aldershot 4 p.c. Pref.	...	53—58	...
1,551,868	,,	Apl. 14	2½	3⅛%	Alliance & Dublin Ord.	59—64	39—44	...
374,000	,,	Jan. 13	4	4%	Do. 4 p.c. Deb.	76—79	47—52	...
280,000	5	Oct. 28	7½	8%	Bombay, Ltd.	5⅛—6⅛	4—4½	...
100,000	5	Feb. 25	16	5%	Bourne- (5 p.c.	...	7—8	...
383,110	10	,,	7	7%	mouth Gas (B 7 p.c.	15—15½	8¼—9½	8¼
115,000	10	,,	6	6/-	and Water (Pref. 6 p.c.	13½—14	7½—8½	...
162,065	—	Dec. 30	—	4%	(4 p.c. Deb.	...	55—60	...
992,045	Stk.	Feb. 25	14	30/-	Brentford A Consolid.	261—266	57—62	53½—54
734,920	,,	,,	11	26/3	Do. B New	204—209	52—57	...
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	68—73	...
221,400	,,	Dec. 15	4	4%	Do. 4 p.c. Deb.	91—93	57—59	...
214,775	,,	Mar. 11	11	7½%	Brighton & Hove Orig.	208—213	95—105	...
244,200	,,	,,	8	5⅛%	Do. A Ord. Stk.	154—159	65—75	...
1,287,500	Stk.	July 29	5	5%	Bristol 5 p.c. max.	...	...	...
530,000	20	Mar. 30	12½	10%	British	...	...	...
120,000	Stk.	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	44—45	22—24	22—23½
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	88—90	50—55	...
100,000	10	May 27	—	—	Cape Town & Dis., Ltd.	85—87	37—40	...
100,000	10	Apl. 28	—	—	Do. 4½ p.c. Pref.	1⅛—2⅛	7—7½	...
100,000	Stk.	Dec. 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	4—6	4½—5½*	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	70—75	55—60	...
1,513,280	,,	Feb. 25	5/9/4	30/-	Commercial 4 p.c. Stk.	108—110	...	...
560,000	,,	,,	5½	26/3	Do. 3½ p.c. do.	106—108	48—53	...
475,000	,,	Dec. 15	3	3%	Do. 3 p.c. Deb. Stk.	103—105	45—50	46
800,000	,,	Dec. 11	4	—	Continental Union Ltd.	69½—71½	42—45	...
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	76—79	20—25	...
51,600	,,	Feb. 5	15	10%	Croydon A 10 p.c.	115—118	30—40	...
278,400	—	—	12	7%	Croydon B and C 7 p.c.	...	120—130	...
492,270	Stk.	,,	6	4½%	Derby Con. Stk.	..	95—105	100—101
55,000	,,	—	4	4%	Do. Deb. Stk.	123—125	...	
1,002,180	10	Jan. 29	10	5/0	European, Ltd.	102—104	...	
16,298,975	Stk.	Feb. 10	4/17/4	30/-	Gas (4 p.c. Ord.	17½—18	6½—7½	7½
2,600,000	,,	,,	3½	26/3	Light (3½ p.c. max.	98—102	52—55	53—54½
4,062,235	,,	,,	4	4%	and (4 p.c. Con. Pref.	76—79	42—45	42—42½
4,674,850	,,	Dec. 15	3	3%	Coke (3 p.c. Con. Deb.	96—99	56—59	57—58½
130,000	,,	Dec. 11	10	10%	(10 p.c. Bonds.	72½—74½	48—51	49—49½
82,500	,,	Mar. 11	5	3½%	Hastings & St. L. 5 p.c.	...	...	...
258,740	,,	,,	3½	2½%	Do. 3½ p.c.	...	48—53	...
70,000	10	May 13	11	5%†	Hongkong & China, Ltd.	87—89	34—39	...
86,600	Stk.	Mar. 11	9	5½%	Hornsey 7 p.c.	16½—16¾	8¼—9¼	...
131,000	,,	Mar. 30	7½	3½%	Ilford A and C	...	75—85	74½
65,780	,,	,,	6½	2½%	Do. B	151—154	75—79	...
65,500	,,	Dec. 30	4	4%	Do. 4 p.c. Deb.	115—118	55—60	...
1,976,000	,,	,,	9	5%†	Imperial Continental	92—94	54—56	...
1,235,000	,,	Feb. 10	3½	3½%	Do. 3½ p.c. Deb. Red.	150—160	148—153	148—151
235,242	,,	Mar. 30	6½	3½%	Lea Bridge Ord. 5 p.c.	84—86	70—80	..
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. (A.	119—121	58—63	58½
306,083	,,	June 26	4	4%	(B.	211—213	...	...
165,736	,,	Feb. 25	7/5/6	3½%	Do. 4 p.c. Pr. Deb. Stk.	146—148	...	...
75,000	5	June 11	6	3%	Maidstone 5 p.c.	...	...	...
250,000	100	Apl. 1	4½	4½%	Malta & Mediterranean Met. of (4½ p.c. Deb.	...	52—57	...
541,920	Stk.	Nov. 26	4	6%	Melbourne (4½ p.c. Deb.	4½—4¾	1¾—2¼	...
1,875,892	,,	Feb. 25	4½	3½%	Monte Video, Ltd.	99—101	88—93	...
529,705	,,	Dec. 30	3½	3½%	Newcastle & Gatsh'dCon.	11½—12	60—70	64
15,000	10	Mar. 11	—	8%	Do. 3½ p.c. Deb.	98½—99½	57—59	57½
55,640	10	,,	7/14/10	53%	North Middlesex 10 p.c.	82—83	50—51	...
300,000	Stk.	Nov. 26	8	8%	,, ,, 7 p.c.	...	12½—13	..
60,000	5	Mar. 26	10	1/-	Oriental, Ltd.	14—15	7—7½	...
60,000	50	Feb. 25	13	7½%	Ottoman, Ltd.	117—122	87—92	...
100,000	50	,,	18	6½%	Portsea Island, B	128—131	2—3	...
249,980	5	April 29	8	—	Do. C	118—121	65—70	...
499,960	5	June 26	5	—	Primitiva Ord.	5½—6	50—55	...
521,600	100	Dec. 1	4	4%	Do. 5 p.c. Pref.	4½—5	⅛—¼	...
600,000	Stk.	Jan. 27	4	4%	Do. 4 p.c. Deb.	91—93	21—1½	27/6
546,198	,,	Dec. 30	4	4%	Do. ,, ,, 1911	...	67—69	...
150,000	10	Mar. 30	6	6/-	River Plate 4 p.c. Deb.	85—87	37—40	38
125,000	50	Jan. 3	5	5%	San Paulo (6 p.c. Pref.	10½—11	37—40	..
135,000	Stk.	Mar. 30	10	5%	(5 p.c. Deb.	47—49	6—7	5⅛
209,984	,,	,,	10	4½%	Sheffield A	223—224	37—39	35
523,500	,,	,,	10	3½%	Do. B	222—224	62—64	..
133,201	Stk.	Sept. 15	4	4%	Do. C	220—222	62—64	...
90,000	10	Sept. 30	9	9%	Shrewsbury 5 p.c.	...	...	...
6,609,895	Stk.	Feb. 10	5/4/0	5%	South African	10½—11⅛	10½—11⅛	...
250,000	,,	Jan. 13	—	5%	South Met. Ord.	111—113	63—66	63⅛—65⅛
1,895,445	,,	,,	3	3%	Do. Red. Pref.	...	90—92	...
224,820	,,	Feb. 25	8½	7½%	Do. 3 p.c. Deb.	72½—74½	45—48	...
1,087,795	,,	,,	6	3½%	South Shields Con. Stk.	157—159	86—88	...
368,837	,,	Dec. 30	5	5%	S'th Suburb'n Ord. 5 p.c.	114—116	56—61	57
647,740	,,	Nov. 12	7½	3½%	Do. 5 p.c. Deb. Stk.	116—118	70—75	...
121,275	,,	Dec. 30	4	4%	Southampton Ord.	99—102	56—59	...
120,000	,,	Feb. 25	—	3½%	Do. 4 p.c. Deb. Stk.	...	57—59	...
782,275	,,	,,	6	2½%	Tottenham (A 5 p.c.	135—138	57—62	58
181,255	,,	Dec. 15	4	4%	District (B 3½ p.c.	115—117	50—55	52—53
182,380	10	Dec. 30	5	—	(4 p.c. Deb.	87—89	53—56	...
149,900	10	July 1	5	5%	Tuscan, Ltd.	5—6	1—2	...
236,476	Stk.	Feb. 25	5	3½%	Do. 5 p.c. Deb. Red.	93—95	45—50	...
					Tynemouth 5 p.c. max.	108½—109	68—70	...
					Wandsworth, Wimbledon, and Epsom—			...
30,000	,,	Feb. 25	8½	47/6	Wandsworth A 5 p.c.	151—156	75—80	
255,636	,,	,,	6½	32/6	Do. B 3½ p.c.	129—134	53—58	...
108,075	,,	,,	—	33/3	Do. C	...	50—55	...
140,865	,,	,,	—	33/3	New Ordinary	...	50—55	...
332,000	,,	,,	6½	26/3	Wimbledon 5 p.c.	117—122	43—48	45
98,000	,,	,,	6½	32/6	Epsom 5 p.c.	121—126	50—55	...
88,416	,,	Dec. 30	3	3%	3 p.c. Deb. Stk.	66—69	40—45	...

* Ex Div. † Next dividend will be at this rate.

Triple Fatality at Hackney.—Early last Friday morning, two men who, for business purposes, entered the house in Morning Lane, Hackney, occupied by Harry Dalby, who was manager to a baker, noticed a strong smell of gas, and subsequently discovered Dalby lying on the stairs dead. His wife and baby were both found dead in bed. There was an escape of gas in the vicinity of the meter.

Partial Discontinuance of Supply at Birmingham.—The Birmingham Gas Department have discontinued the supply between 2 and 4.30 p.m. and 6 and 9 p.m. Consumers have been warned, of course, that all taps and bye-pass lights must be turned off between the hours named; and though small quantities of gas may be passing in certain parts of the city, its use during the prohibited hours will be attended by considerable risk to consumers. The restriction has effected a remarkable saving of something like 25 p.ct.; and it has caused many firms to close their factories early in the afternoon.

Wages at Bradford.—The Advisory and Co-Ordination Sub-Committee of the Bradford Corporation (created specially with a view to curtailing expenditure) received deputations last week from four trade unions, who asked that no deductions should be made at present from the wages of Corporation employees, as had been recommended by the Committee. The Committee eventually decided to recommend to the Corporation that, as from May 18, employees affected by national awards, &c., now or hereafter in operation should be paid strictly in accordance with the minimum rates therein, provided that, where this would involve a reduction of more than 2d. per hour, the 2d. reduction should be made from the 18th inst., with a subsequent reduction of 2d., or such sum as may be necessary, at the end of each four weeks, until full effect be given to the resolution.

The Blackburn Gas Committee have intimated that, owing to the cost of laying mains to Billington, they do not propose to exercise the powers to supply this district, and will not offer objection to any other authority obtaining powers.

The Furness Railway Company have intimated to the Barrow Corporation Gas Committee that, as the production of gas at Piel for lighting purposes is bringing upon them increasingly heavy loss, they have decided to cease supply at the end of this year; and it was thought well that the Corporation should be informed of this in anticipation of notice being sent to consumers. They would be glad to discuss the position with the Committee. The Committee asked the Company to send representatives to the next meeting.

Messrs. J. & W. B. Smith, Ltd., of Farringdon Road, E.C., are issuing a new list (No. 148) of gas rings, grillers, hot-plates, &c

Owing to the high initial cost of lighting the place by electricity, the Ryde (I.W.) Town Council have decided to enter into a contract with the Gas Company.

Henry Hawkworth, gateman at the Huddersfield Corporation Gas-Works, at Leeds Road, died in the Huddersfield Infirmary, on Thursday last, from injuries received the previous day, when he had slipped and been run over by a motor wagon entering the works. The wagon was pulled up instantly; but it was found that one wheel was on the lower part of Hawkworth's body.

Three employees of the Davis Gas Stove Company (Messrs. S. E. Allen, J. Neil, and J. T. Turnbull) have been selected to play bowls for Bedfordshire in the Bedfordshire *v.* New Zealand match, which will take place at Bedford on the 14th inst.; while on the Davis Company's bowling green at Luton is to be held the County Match, Bedfordshire *v.* Middlesex, on June 22.

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